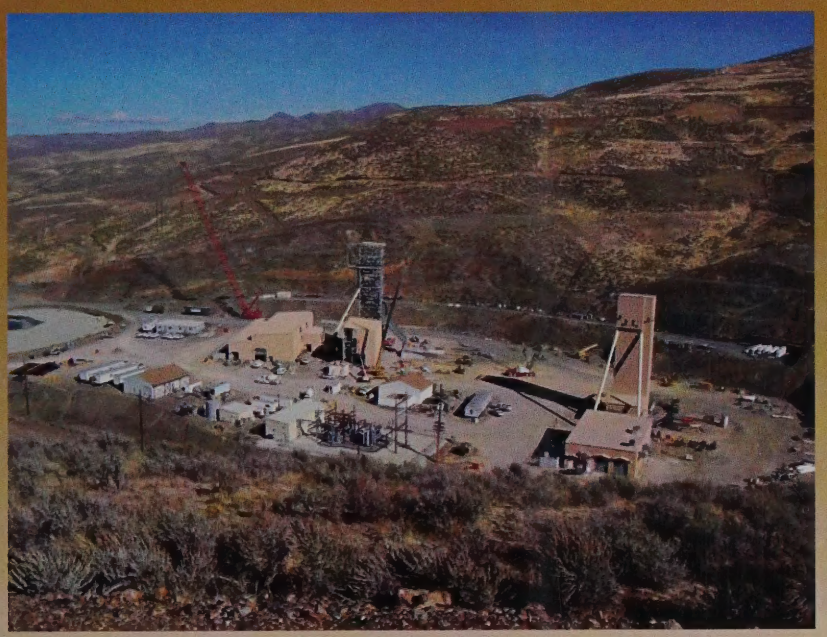
FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

LEEVILLE PROJECT



Circa November 2003

MARCH 2010

BLM

Elko District Office - Nevada

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/NV/EK/ES-10/19+1793

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Elko District Office
3900 Idaho Street
Elko, Nevada 89801-4211
http://www.blm.gov/nv/st/en/fo/elko_field_office.html

TAKE PRIDE IN AMERICA

In Reply Refer To:
1793.7/3809

April 2, 2010

Dear Reader:

Enclosed for your review is the Final Supplemental Environmental Impact Statement (FSEIS) for Newmont Mining Corporation's Leeville Project. This FSEIS supplements the cumulative effects analysis originally presented in the Leeville Project 2002 Environmental Impact Statement by providing expanded and updated analyses of cumulative effects consistent with the recent decision by the U.S. Court of Appeals for the Ninth Circuit in *Great Basin Mine Watch v. Hankins*, 456 F.3d 955 (9th Cir. 2006).

The Record of Decision for the Leeville Project was signed September 25, 2002, and the mine has been in development and operation since that time. The Leeville Project consists of the West Leeville, Four Corners, and Turf ore bodies which will be accessed by five shafts, a waste rock disposal facility, and other ancillary facilities, including dewatering facilities. The Leeville Mine is located approximately 20 miles northwest of Carlin, Nevada.

The cumulative effects analyses in this FSEIS incorporate qualitative and quantitative data collected since 2002; expand the analysis of cumulative effects of mining and other land uses where appropriate; and add additional detail with respect to the analytical processes used in the original EIS.

Following a 30-day public review period, initiated by publication of the Notice of Availability in the Federal Register, a Record of Decision (ROD) will be published. The decision reached in the ROD is subject to appeal under BLM's surface management regulations at 43 CFR 3809.800.

Your interest in the management of public lands is appreciated. If you have any questions, please contact Deb McFarlane, Leeville SEIS Project Manager at (775) 753-0200.

Sincerely,

Kenneth E. Miller,
District Manager

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
LEEVILLE PROJECT
CUMULATIVE EFFECTS

Elko and Eureka Counties, Nevada

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

March 2010

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
LEEVILLE PROJECT
CUMULATIVE EFFECTS

LEAD AGENCY:	**U.S. Department of the Interior** **Bureau of Land Management** **Elko District Office** **Elko, Nevada**
PROJECT LOCATION:	**Elko and Eureka Counties, Nevada**
COMMENTS ON THIS DRAFT SEIS SHOULD BE DIRECTED TO:	**Ms. Deb McFarlane** **SEIS Project Manager** **Elko District Office** **3900 East Idaho Street** **Elko, NV 89801**
DATE BY WHICH COMMENTS MUST BE POSTMARKED TO BLM:	**Within 30 days of the date of the Notice of Availability published in the Federal Register**

ABSTRACT

This Final Supplemental Environmental Impact Statement (Final SEIS) provides responses to comments received by BLM during the public comment period on the Draft SEIS for the Leeville Project and additional information regarding cumulative effects associated with gold mining projects located in the Carlin Trend, northwest of Carlin, Nevada. The Leeville Project was authorized in 2002, has been constructed, and is currently being operated by Newmont Mining Corporation.

This Final SEIS supplements the cumulative effects analyses originally presented in the Draft SEIS and Final Leeville Project EIS by providing expanded and updated analyses of cumulative effects consistent with the recent decision by the United States Court of Appeals for the Ninth Circuit - Great Basin Mine Watch v. Hankins, 456 F.3d 955 (Ninth Circuit 2006).

The cumulative effects analyses in this Final SEIS incorporates qualitative and quantitative data collected since 2002; expanded analyses of cumulative effects of the project combined with other mining and land uses where appropriate; and descriptions of analytical processes used to determine cumulative effects.

Responsible Official for EIS:

for Kenneth E. Miller
Manager, Elko District Office
Bureau of Land Management

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
LEEVILLE PROJECT
CUMULATIVE EFFECTS

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF APPENDICES

CHAPTER 1
INTRODUCTION

The United States (U.S.) Department of Interior, Bureau of Land Management's (BLM) Elko District Office prepared this Final Supplemental Environmental Impact Statement (SEIS) for the Leeville Project to provide responses to comments received by BLM during the public comment period on the Draft SEIS for the Leeville Project (BLM 2007a) and additional information regarding cumulative effects associated with the Project when combined with past, present, and reasonably foreseeable future land use activities in the Carlin Trend area (**Figure 1-1**). The Leeville Project was authorized in 2002, has been constructed, and is currently being operated by Newmont Mining Corporation (Newmont).

This Final SEIS supplements the cumulative effects analyses originally presented in the Leeville Project EIS (BLM 2002a) by providing expanded and updated analyses of cumulative effects consistent with the recent decision by the U.S. Court of Appeals for the Ninth Circuit: Great Basin Mine Watch v. Hankins, 456 F.3d 955 (Ninth Circuit 2006).

Descriptions of the Leeville Project, affected environment, and potential direct and indirect impacts of the Project are included in the EIS document (BLM 2002a). In addition, the Leeville EIS provides descriptions of irreversible and irretrievable commitment of resources, residual adverse impacts, and potential mitigation and monitoring measures for the Leeville Project.

The Leeville Project EIS (BLM 2002a) analyzed three alternatives to the Proposed Action: Alternative A – Eliminate Canal Portion of Water Discharge Pipeline; Alternative B – Backfill Shafts; and Alternative C – Relocate Waste Rock Disposal Facility and Refractory Ore Stockpiles. All three of these alternatives were selected by BLM as the Preferred Alternative in the Leeville Project EIS (BLM 2002a). Cumulative effects resulting from implementation of these alternatives are addressed in this Final SEIS.

The cumulative effects analysis in this Final SEIS incorporates qualitative and quantitative data collected since 2002 and incorporates by reference the information and analyses contained in the Leeville Project EIS (BLM 2002a) and South Operations Area Project Amendment (SOAPA) EIS (BLM 2002b) documents; expanded analyses of cumulative effects of mining and other land uses where appropriate; and additional detail with respect to the analytical processes used. The purpose and need for the action, project history for existing operations (including legal background for the analysis), and issues raised during scoping are discussed in the sections below.

PURPOSE AND NEED

The purpose of Newmont's Leeville Project is to use the existing work force to conduct mining on unpatented mining claims and fee land to produce gold from ore reserves contained in the ore deposit. Gold is an established commodity with international markets and demand. Uses include jewelry, investments, as a standard for monetary systems, electronics, and other industrial applications.

BLM is responsible for managing mineral rights access on certain public land as authorized under the General Mining Law of 1872, as amended. Under the law, persons are entitled to reasonable access to explore for and develop mineral deposits on public domain land that has not been withdrawn from mineral entry.

In order to use public land managed by the BLM Elko District Office, Newmont must comply with BLM Surface Management Regulations (43 CFR 3809) and other applicable statutes, including the Mining and Mineral Policy Act of 1970 (as amended) and Federal Land Policy and Management Act of 1976. BLM must review Newmont's plans to ensure the following:

- Adequate provisions are included to prevent unnecessary or undue degradation of public land and to protect non-mineral resources of public land;
- Measures are included to provide for reclamation of disturbed areas; and
- Compliance with applicable state and federal laws is achieved.

PROJECT HISTORY AND STATUS

The area of gold mining activity and development in the vicinity of Carlin, Nevada is known as the Carlin Trend. The Carlin Trend is an approximately 50-mile-long, 5-mile-wide belt of multiple major gold deposits extending from approximately 10 miles southeast (Emigrant deposit) to approximately 40 miles northwest (Hollister deposit) of Carlin (**Figure 1-2**). Although the area has been mined for the past 120 years, major mining activity began with development of the Carlin Pit in 1965. As a result of mining since 1965, the Carlin Trend has become the most prolific gold field in the Western Hemisphere.

In April 1997, Newmont submitted a proposed Plan of Operations to the Elko District Office of the BLM for its Leeville Project located about 20 miles northwest of Carlin, Nevada (**Figure 1-2**). The Plan of Operations proposed activities to develop and operate an underground mine and associated surface support facilities.

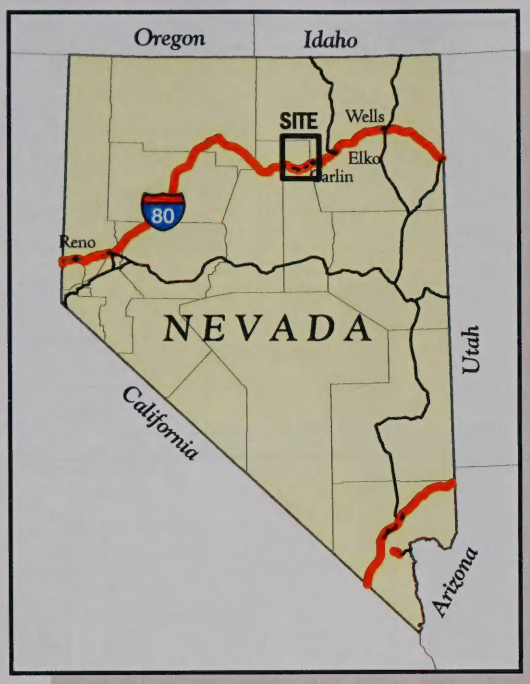
BLM compiled a Draft EIS for the Leeville Project which was released in March 2002, and a Leeville Project Final EIS was completed in July 2002 (BLM 2002a). BLM issued a Record of Decision (ROD) for Leeville in September 2002 that selected an agency-preferred alternative and identified mitigation measures to be implemented for the project. In April 2000, BLM also released the *Cumulative Impact Analysis (CIA) of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project* (BLM 2000). This report analyzed potential effects to surface water and groundwater that could result from dewatering and subsequent discharge of excess water associated with proposed and existing mining projects in the Carlin Trend.

In November 2002, two special interest groups filed an action in U.S. District Court for the District of Nevada challenging BLM's RODs for the Leeville and SOAPA mine projects, as well as BLM's bonding decisions for SOAPA. The groups alleged violations of the National Environmental Policy Act (NEPA), Clean Water Act, and several other legal authorities.

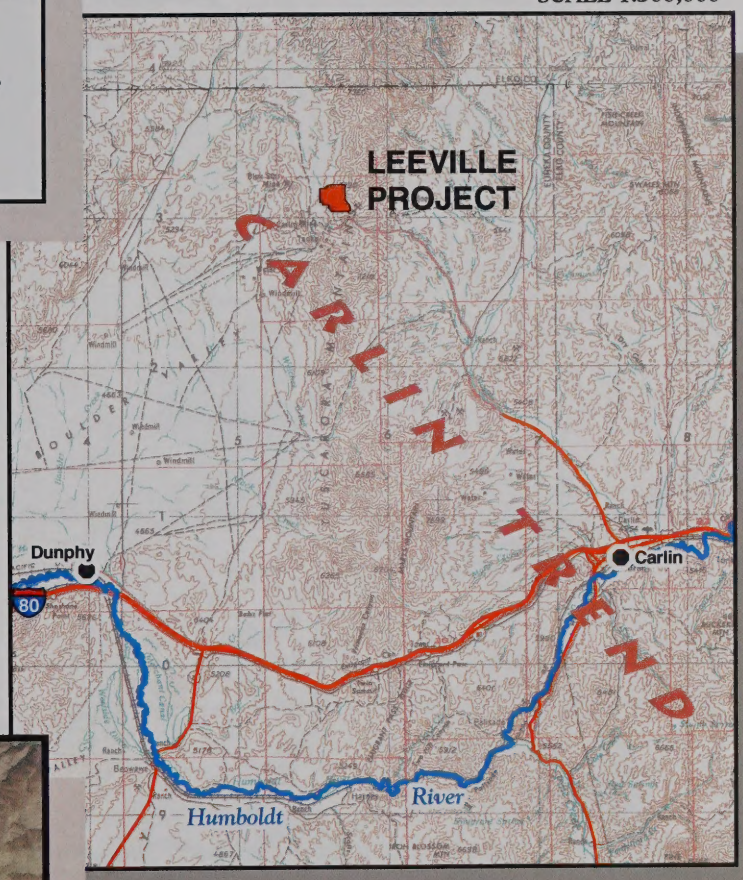
In March 2004, the district court rejected the challenge on cross-motions for summary judgment, and the special interest groups appealed. On August 1, 2006, the U.S. Court of Appeals for the Ninth Circuit concluded that, with the exception of dewatering and discharge of water, BLM's analysis of certain cumulative effects in the Leeville Project and SOAPA EIS documents did not meet the requirements of NEPA (Great Basin Mine Watch v. Hankins, 456 F.3d 955, 9th Circuit 2006). The Ninth Circuit substantially affirmed the district court's decision upholding the Leeville Project EIS and SOAPA EIS in all other respects.

Since BLM's issuance of the ROD in 2002, much of the Leeville Project has been constructed and is being operated by Newmont. Those project components include:

- Developing and operating the Leeville underground mine – including construction of one hoist and one ventilation shaft to support underground mining for production, underground access, and ventilation.
- Constructing a waste rock disposal facility.



SCALE 1:500,000



SCALE 1:100,000

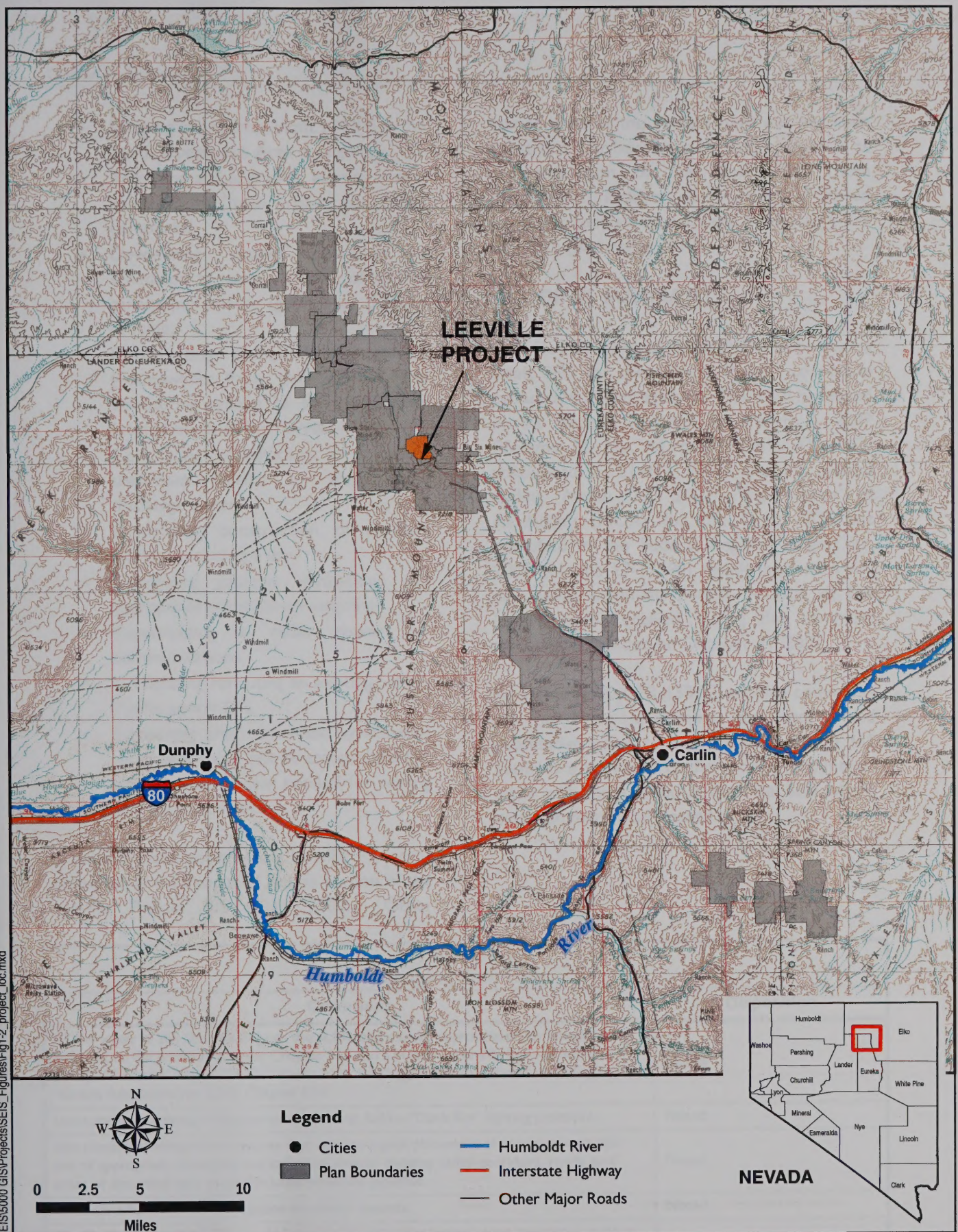
U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

GENERAL LOCATION
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

1-1

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS Figures\Fig1-1 General Location Leeville.mxd



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

PROJECT LOCATION
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
1-2

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig1-2_project_loc.mxd

- Shipping ore to Newmont's Mill 6 in the South Operations Area is ongoing.
- Rerouting and upgrading existing access road to a haul road has been completed.
- Dewatering system operation is scheduled to pump a peak of 23,000 gallons per minute (gpm) over the life-of-mine.
- Constructing a pipeline to convey groundwater from the Leeville Mine dewatering system to Barrick's facility located north of the Leeville Mine.
- Completing construction of a water treatment facility to treat mine discharge water.
- Completing construction of ancillary facilities including a dry.
- Continuing geologic evaluations and exploration activities are ongoing.
- Constructing a radio tower for communications.
- Completing rerouting an existing Sierra-Pacific power line.
- Reclaiming areas disturbed by activities described above will be accomplished as areas are no longer needed for mining or related activities.

A detailed description of the Leeville Project is contained in the Proposed Action section of the Leeville Project EIS (BLM 2002a). Other components of the Project have not yet been constructed or have been partially completed as of preparation of this Final SEIS. These components include construction of three additional ventilation shafts and a refractory ore stockpile (Newmont 2010a).

SCOPING SUMMARY

BLM filed a Notice of Intent (NOI) to prepare a Draft SEIS for the Leeville Project to update cumulative effects analysis. The NOI appeared in the Federal Register on March 7, 2007 (Volume 72, No. 44, page 10241). The NOI announced a 21-day public scoping period ending March 29, 2007. The Notice of Availability (NOA) for the Draft SEIS was published in the Federal Register August 31, 2007 (Notice E7-17588) which initiated a 60-day public comment period. A total of five letters were received during the comment period which ended on October 31, 2007.

As stated in 40 CFR 1501.7, scoping comments are used to determine the scope and substantive issues to be addressed. **Table 1-1** contains a summary of the scoping comments, along with the location in this Final SEIS where each comment is addressed, if any.

TABLE 1-1
Scoping Summary

Comment	Disposition
All the water of the State belongs to the public and may be appropriated for beneficial use pursuant to the provisions under Chapter 533 and 534 of the Nevada Revised Statutes (NRS). All mineral exploration boreholes must be plugged and abandoned according to the Nevada Administrative Code Chapter 534.	Noted
Use consistent lighting mitigation measures that follow "Dark Sky" lighting practices.	Noted
Use consistent mitigation measures that address logical placement of improvements and use of appropriate screening and structure colors. Existing utility corridors, roads, and areas of disturbed land should be used wherever possible.	Noted
Consider alternatives and mitigation to reduce impacts.	Noted
The Draft Supplemental EIS should focus on the following issues; water resources, surface water quality, waste rock, heaps, pit lakes, air quality, mercury, aquatic habitat and fisheries, and Native American issues.	Cumulative Effects - Chapter 3

TABLE 1-1
Scoping Summary

Comment	Disposition
For surface water, the whole Humboldt River drainage must be considered. Any salt or metals added to the river will have cumulative impacts with those from other mines, or power plants.	Water Quantity and Quality – Chapter 3
The study area boundaries should be defined for each resource based on the resource and level of disturbance to the resource	Noted
Detail each of the past, present and reasonably foreseeable exploration and development operations.	Past, Present, and Reasonably Foreseeable Future Activities – Chapter 2
Verify the predictions of the drawdown modeling done in 1998 by comparing them to monitoring data collected since. Recalibrate the model if predictions not substantially accurate. Make future predictions after recalibration (if needed).	Water Quantity and Quality – Chapter 3
Update the pit lake models.	Water Quantity and Quality - Chapter 3
Include changes in surface water flow along the Humboldt River in the modeling.	Water Quantity and Quality - Chapter 3
Analyze effects on federal reserved water rights, catalogue each potential affected water right, and the impacts.	Water Quantity and Quality – Chapter 3
Complete a cumulative analysis of waste rock, including an evaluation of potential releases of toxic substances	Geology and Mineral Resources - Chapter 3
Evaluate acid mine drainage potential using quarterly reporting for water pollution control permits.	Water Quantity and Quality – Chapter 3
Map heaps, including current disposal proposals.	Introduction – Chapter 1
Review all other facilities at mines within the broad cumulative impact review area.	Noted
Map pit lakes. Use the Lone Tree pit lake to verify models. Analyze effects of pit lake water quality on migratory birds and other wildlife, and groundwater.	Water Quantity and Quality – Chapter 3
Review air quality in light of the proposed coal-fired power plant and other sources.	Air Quality – Chapter 3
Analyze releases of mercury from all sources (mines, coal burning, limestone kilns, wildfires, other).	Air Quality – Chapter 3
Study the airshed of northern Nevada, including local and regional impacts.	Air Quality – Chapter 3
Impacts on fish of changes in flows in the Humboldt River system, contaminant loading, and mercury emissions.	Water Quantity and Quality; Air Quality; Fisheries and Aquatic Resources – Chapter 3
Ability of Native Americans to fully practice the traditional religions, including sacred and spiritual sites, and traditional food and medicine gathering.	Native American Concerns – Chapter 3

CHAPTER 2

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

This chapter summarizes past, present, and reasonably foreseeable activities in the Carlin Trend. This information forms the basis for discussion of cumulative effects in Chapter 3. Information contained in this chapter includes summaries of changes and/or progress made for activities within the Cumulative Effects Study Area (Study Area) since 2002 – the year that the Leeville Project EIS was compiled and a Record of Decision (ROD) issued.

The Council on Environmental Quality (CEQ) defines cumulative impact as:

> "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

The geographic area for which past, present, and reasonably foreseeable future activities are described encompasses the Carlin Trend mining complex. The Carlin Trend is a mineralized zone approximately 50-miles-long by 5-miles-wide in north central Nevada where multiple mining operations have been developed. Some activities described in this chapter are located proximal to the mining operations, and other activities are located in adjacent areas (**Figure 2-1**).

Past, present, and reasonably foreseeable land uses (e.g., grazing and recreation), activities (mining), and phenomena (wildfire) cumulatively affect resources to various degrees over a given area. Cumulative effects are discussed on a resource by resource basis in Chapter 3. With the exception of social and economic resources, the past, present, and reasonably foreseeable activities and subsequent cumulative effects to the various resources generally fall within the area shown on **Figure 2-2.** Detailed descriptions and rationale used to develop individual resource cumulative effects study areas are provided in Chapter 3.

GRAZING AND AGRICULTURE

PAST and PRESENT ACTIVITIES

Livestock grazing has been and continues to be a co-dominant (with mining) land use in the vicinity of the Carlin Trend. Multiple grazing allotments have been permitted and administered by BLM over the past several decades. Portions of 13 grazing allotments and/or federal fenced range exist within the Study Area (**Figure 2-3**). The carrying capacity of the 13 grazing allotments totals approximately 114, 000 animal unit months (AUMs). The capacity of these allotments has been adjusted over the years in response to mine development, drought, wildfires, and availability of stock water.

Surface water sources that support livestock grazing and agriculture within the area include the Humboldt River, Willow Creek Reservoir, perennial creeks, springs, and seeps. Improved water sources include developed springs, stock wells, stock ponds, water pipelines, and troughs.

Livestock will generally congregate near these features. Cow-calf pairs, heifers, steers, and cows graze on residual forage in alfalfa fields, irrigated pastures, and rangeland within the Study Area.

A parcel of private land located in the southern portion of Boulder Valley (TS Ranch) is owned and operated by Elko Land and Livestock Company, a subsidiary of Newmont. In 1990, Barrick Goldstrike Mines, Inc., (Barrick) began dewatering the Betze/Post Mine as its mining operations advanced below the groundwater level. Barrick and the TS Ranch entered into an agreement to put water from mine dewatering operations to beneficial use through irrigation (TS Ranch 2009).

In lieu of pumping existing groundwater wells to fulfill water rights owned by Elko Land and Livestock Company for irrigation purposes in Boulder Valley, the State Engineer allowed a "substitution of use" authorizing TS Ranch use of water from Barrick's dewatering wells. The "substitution of use" authorization does not preclude future pumping of groundwater by TS Ranch commensurate with their original water right upon cessation of dewatering operations by Barrick (Pettit 2007).

Barrick began providing water for irrigation on the TS Ranch in the Boulder Valley in 1991 and this irrigation is ongoing today. Water from dewatering of Barrick's Betze/Post Mine and Newmont's Leeville Mine (beginning in 2003) is used for irrigation purposes from April through October annually. Water is used to grow alfalfa hay - a major cash crop for the TS Ranch. Three to four cuttings are harvested annually, with yields averaging 5.2 tons per acre. Top end hay is directed to the California dairy markets, with the balance being sold to neighboring ranchers or consumed by the TS Ranch cowherd (TS Ranch 2009).

Irrigation rates range from an average of 10 pivots applying 5,497 acre feet (af) of water over an average of 2,670 acres during the 1991 season (April through October) to an average of 53 pivots irrigating 7,936 acres with 23,438 af of water during the 2006 season (April through October) (Newmont 2009a). During the period of November through March of each year all excess water from Barrick's Betze/Post Mine and Newmont's Leeville Mine dewatering operations flow to the TS Ranch Reservoir (Barrick 2007a).

Willow Creek Reservoir is used to support alfalfa and native grass hay production on the Squaw Valley Ranch owned by Barrick (**Figure 2-3**). Information on irrigation rates for this ranch is not available. The ranch also raises cattle.

Other private land operations in the Study Area include the Dean and Sharon Rhoads and Van Norman Ranches Inc. which use surface water sources to support native grass hay production (**Figure 2-3**). These ranches also raise cattle and horses. Information on water sources and rates of irrigation are not available.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Livestock grazing is expected to continue at levels established on the various grazing allotments included in the Study Area. Short-term (typically 2 to 4 years) adjustments to livestock numbers are expected in response to range fires which have impacted forage levels. Livestock water supplies affected by mine dewatering activities would be replaced in accordance with permit conditions for each mining operation.

The following project is proposed as part of the on-going livestock management program for the BLM Elko District Office, separate from mining-related activities:

T 38 N/R 48 E
T 38 N/R 49E
T 38 N/R 50E
T 38 N/R 51E
T 38 N/R 52E
T 38 N/R 53E
T 37 N/R 48 E
T 37 N/R 49 E
T 37 N/R 50 E
T 37 N/R 51 E
T 37 N/R 52 E
T 37 N/R 53E
T 36 N/R 48 E
T 36 N/R 49 E
T 36 N/R 50 E
T 36 N/R 51 E
T 36 N/R 52 E
T 36 N/R 53 E
T 35 N/R 48 E
T 35 N/R 49 E
T 35 N/R 50 E
T 35 N/R 51 E
T 35 N/R 52 E
T 35 N/R 53 E
T 34 N/R 48 E
T 34 N/R 49 E
T 34 N/R 50 E
T 34 N/R 51 E
T 34 N/R 52 E
T 34 N/R 53 E
T 33 N/R 48 E
T 33 N/R 49 E
T 33 N/R 50 E
T 33 N/R 51 E
T 33 N/R 52 E
T 33 N/R 53 E
T 32 N/R 48 E
T 32 N/R 49 E
T 32 N/R 50 E
T 32 N/R 51 E
T 32 N/R 52 E
T 32 N/R 53 E
T 31 N/R 48 E
T 31 N/R 49 E
T 31 N/R 50 E
T 31 N/R 51 E
T 31 N/R 52 E
T 31 N/R 53 E
Dunphy
Carlin
80
Humboldt River

SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N
W
E
S

0 1.5 3 6
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Townships

Mine Disturbance

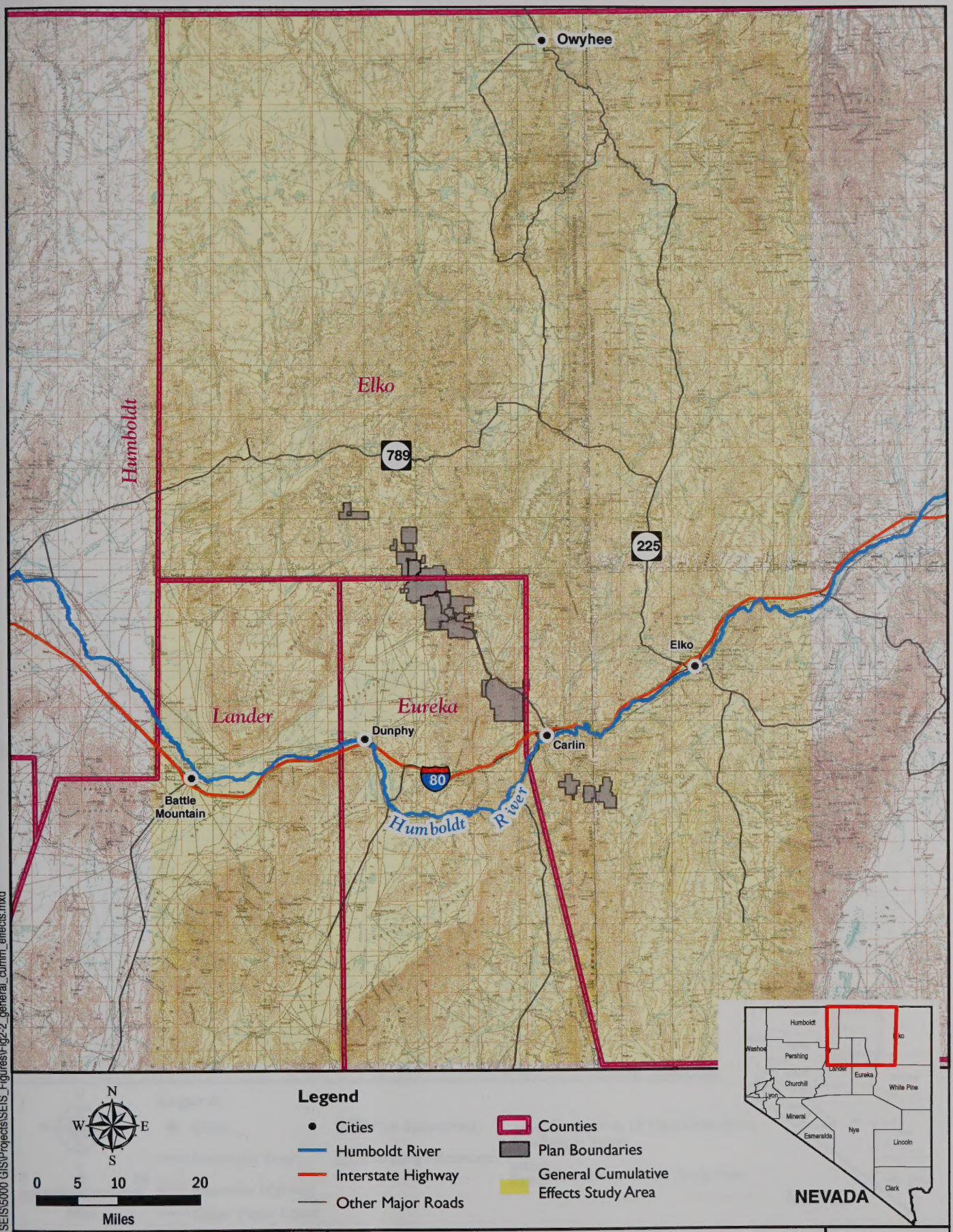
- Ancillary
- Leach Pad
- Pits
- Waste Rock Dumps

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

MINE DISTURBANCE - CARLIN TREND IN NEVADA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-1

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig2_Disturbance.mxd

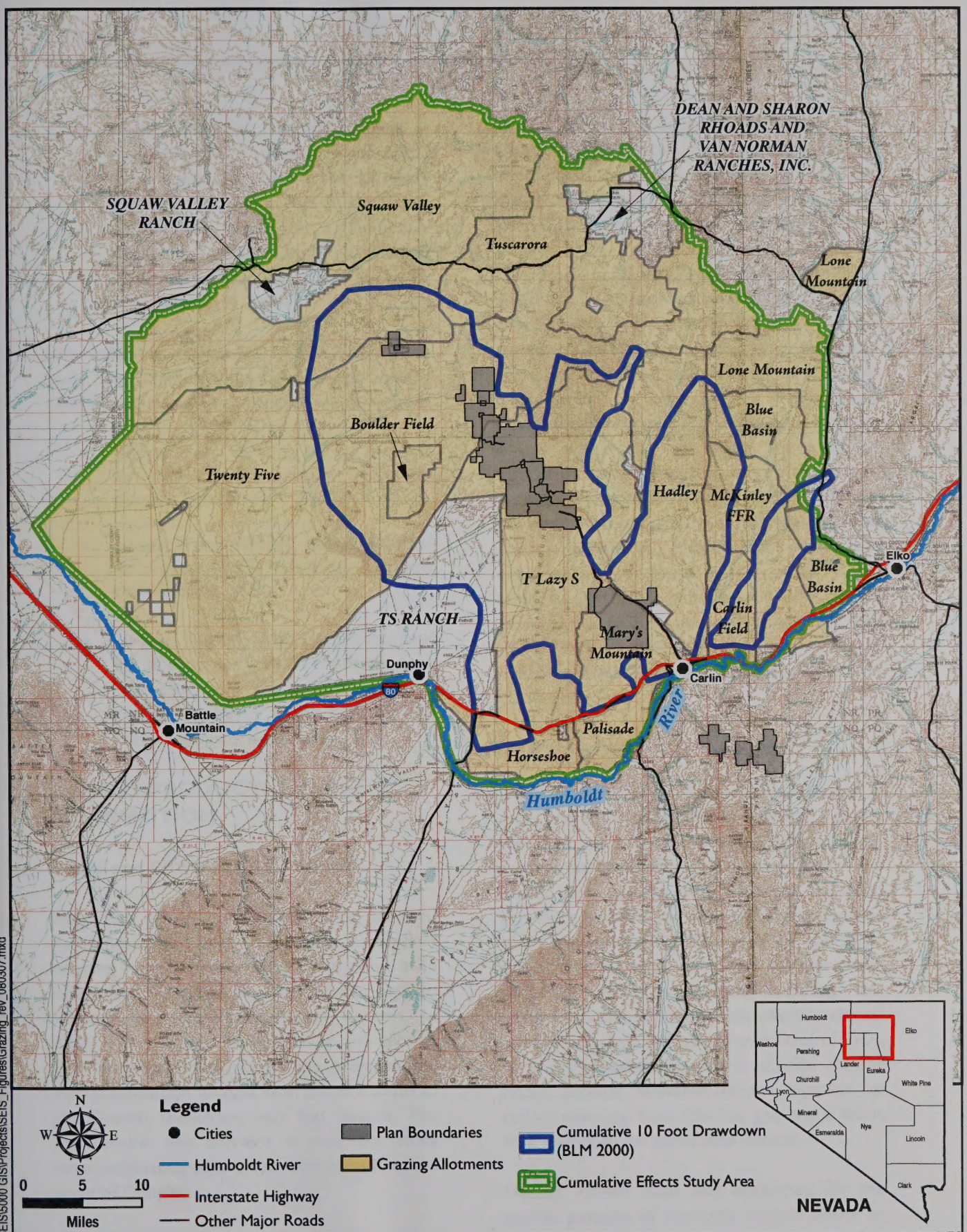


U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

GENERAL CUMULATIVE EFFECTS AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-2

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig2-2_general_cumm_effects.mxd



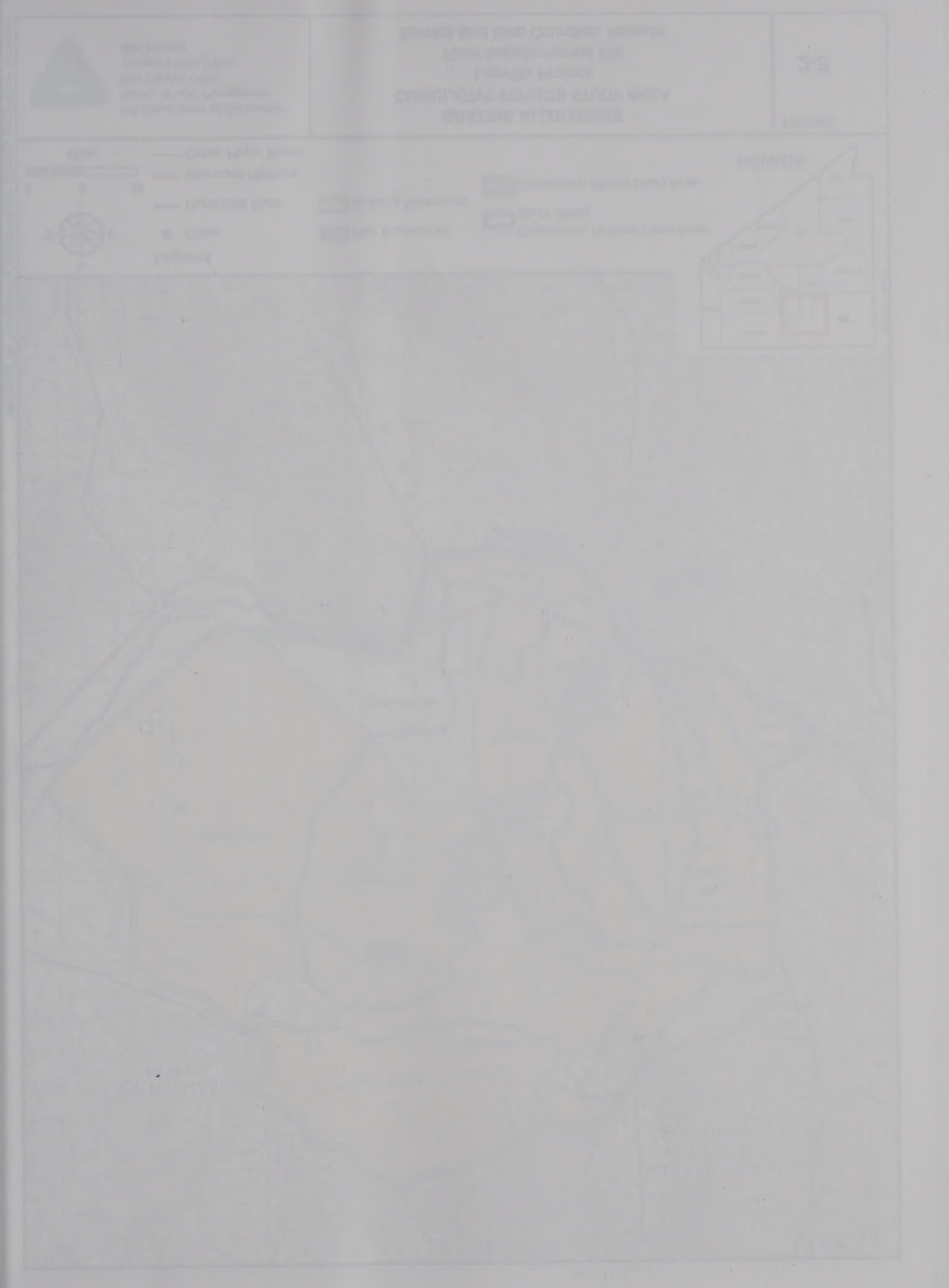
U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

GRAZING ALLOTMENTS
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

2-3

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Grazing_rev_080307.mxd



- Black Mountain Division Fence – Approximately 3 miles of three-strand fence would be constructed to divide the Black Mountain and Sheep Creek Areas. This would be a temporary Emergency Stabilization/Rehabilitation (ESR) fence along Rock Creek in the 25 Allotment (BLM 2006a).

The following reasonably foreseeable actions have been identified through current scoping and/or planning to be considered and evaluated:

- 10-year Term Grazing Permit Renewal for the Spanish Ranch Allotment (scoping completed in 2008).
- 10-year Term Grazing Permit Renewal for Squaw Valley Allotment (scoping completed in 2008).
- 10-year Term Grazing Permit Renewal for all allotments within the Study Area will occur within the project lifetime as permits expire or as the need to fully process permits is identified.

ENERGY PRODUCTION AND DISTRIBUTION

PAST and PRESENT ACTIVITIES

Upgraded power lines have been installed throughout the Carlin Trend area to support ongoing mining activity. Rights-of-way have been established across public and private land to accommodate these distribution systems. In 2004, Sierra Pacific completed a 345-kilovolt (kV) electrical transmission line between the Falcon substation located near Dunphy south to the Gonder substation near Ely, Nevada. The transmission line corridor is near the Study Area, originating adjacent to Interstate-80 at the town of Dunphy.

Section 368 of the Energy Policy Act of 2005 (PL 109-58) directed the Secretary of the Interior to designate corridors for oil, gas, hydrogen pipelines, and electricity transmission and distribution facilities on public land administered by BLM. In a subsequent Programmatic EIS and Record of Decision (BLM 2009) the BLM adopted interagency operating procedures for administration of energy transport development within the designated corridors; identified requirements to expedite coordinated, consistent, interagency management procedures for permitting rights-of-way within the corridors; and identified mandatory requirements to ensure that future projects developed within the corridors are planned, constructed, operated, and decommissioned in a manner that protects and enhances environmental resources and long-term sustainability. This Record of Decision amends the Elko Resource Management Plan (BLM 1987) to include energy corridor 17-35 which parallels Interstate Highway 80 in the Carlin area.

TS Power Plant

Construction of the TS Power Plant located 3 miles north of Dunphy in Eureka County, Nevada was completed in early 2008 and began commercial operations in June, 2008. The power plant consists of a pulverized coal-fired generator with a name plate generating capacity of 242 megawatts (MW), fueled by low-sulfur sub-bituminous coal. The plant includes state-of-the-art emission controls including low nitrogen oxide (NO_x) burners, overfire air and selective catalytic reduction for control of NO_x; spray dry absorber for control of sulfur dioxide (SO_2); powder activated carbon injection to collect mercury from the flue gas, and a fabric filter baghouse for particulate control.

The TS Power Plant was developed for the specific purpose of providing electric power to Newmont's gold mining and ore processing

operations at various locations across northern Nevada. Current peak loads to serve Newmont's operations range from 180 to 190 MW. The TS Power Plant supplies approximately 130 MW for Newmont operations in the Nevada Energy Power Company service area. Excess annual capacity is made available to the Nevada Energy Power Company system. A new 120 kV transmission line has been constructed from the power plant to the Falcon substation located about seven miles north of the plant, where power is distributed into the Nevada Energy transmission grid.

The power plant requires an estimated 4,800 acre-feet of water annually. Water is supplied from production wells located north of the power plant. Assuming a 24-hour power generation cycle, the water demand for the power plant is approximately 2,500 gal/min. The plant has a design life of about 50 years.

The TS Power Plant burns approximately 800,000 tons of Powder River Basin coal annually. Coal is delivered to the site via 130-car unit trains. During full load operations, one train load (approximately 15,000 tons) of coal is delivered to the site about every five days (Laybourn 2009).

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Ruby Pipeline, L.L.C. has proposed to construct and operate a 675-mile long buried natural gas pipeline extending from southwest Wyoming, across Utah, Nevada, and terminating near the Oregon – California border. The pipeline would be located about 15 to 20 miles north of the Carlin Trend and constructed within a 115-foot wide corridor. The Project would be constructed across 97 miles of public land administered by BLM and 70 miles of private land within Elko County, Nevada. A compressor station (Wieland Flat) would be constructed about 35 miles north of Elko, Nevada.

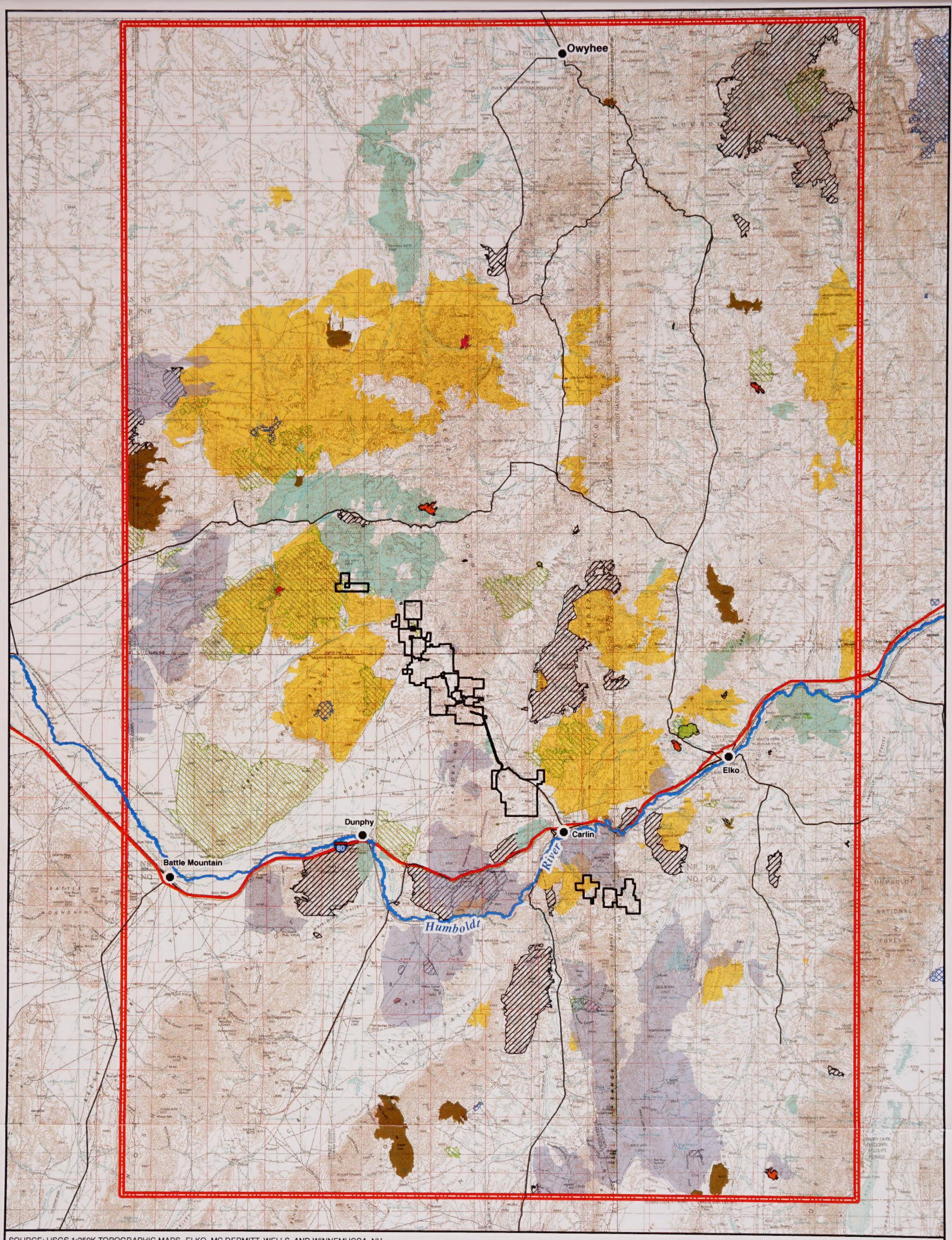
Construction would involve stripping and stockpiling growth media; trenching; placement and burial of a 42-inch diameter steel pipeline in a six-foot deep trench; replacement of growth media; and regrading and revegetation of disturbed areas. The Project is scheduled to begin in spring 2010 with completion projected by spring of 2011. Ruby Pipeline estimates that 400 to 700 workers would be required to construct the pipeline and Wieland Flat Compressor Station in Elko County (FERC 2009).

WILDFIRES AND RESEEDING

PAST and PRESENT ACTIVITIES

Over the last decade, the BLM Elko District Office averaged 150 fires per season that burned approximately 1,000,000 acres. Approximately 38 percent (941,793 acres) of wildlife and livestock grazing habitat in the Study Area has been impacted by fire between 1999 and 2008. This includes approximately 116,000 acres that burned more than once during the period (BLM 2007b). **Figure 2-4** depicts the cumulative burn areas for the period 1999 through 2008.

Since 1992, public and private entities have worked to restore range habitat for wildlife and livestock on areas affected by wildfire. Restoration work during 2006 by BLM and Nevada Department of Wildlife (NDOW) included fencing burned areas to preclude livestock grazing and reseeding within the Study Area. Some tracts of land are reseeded and others are allowed to reseed naturally (either through recovery of burned plants or under natural release of seeds from adjacent areas). Reseeding efforts are shown on **Figure 2-5**.



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N
W E
S

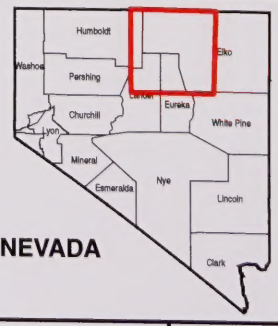
0 2.5 5 10 15
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- General Cumulative Effects Area
- Plan Boundaries

Fire Years

1999	2004
2000	2005
2001	2006
2002	2007
2003	2008

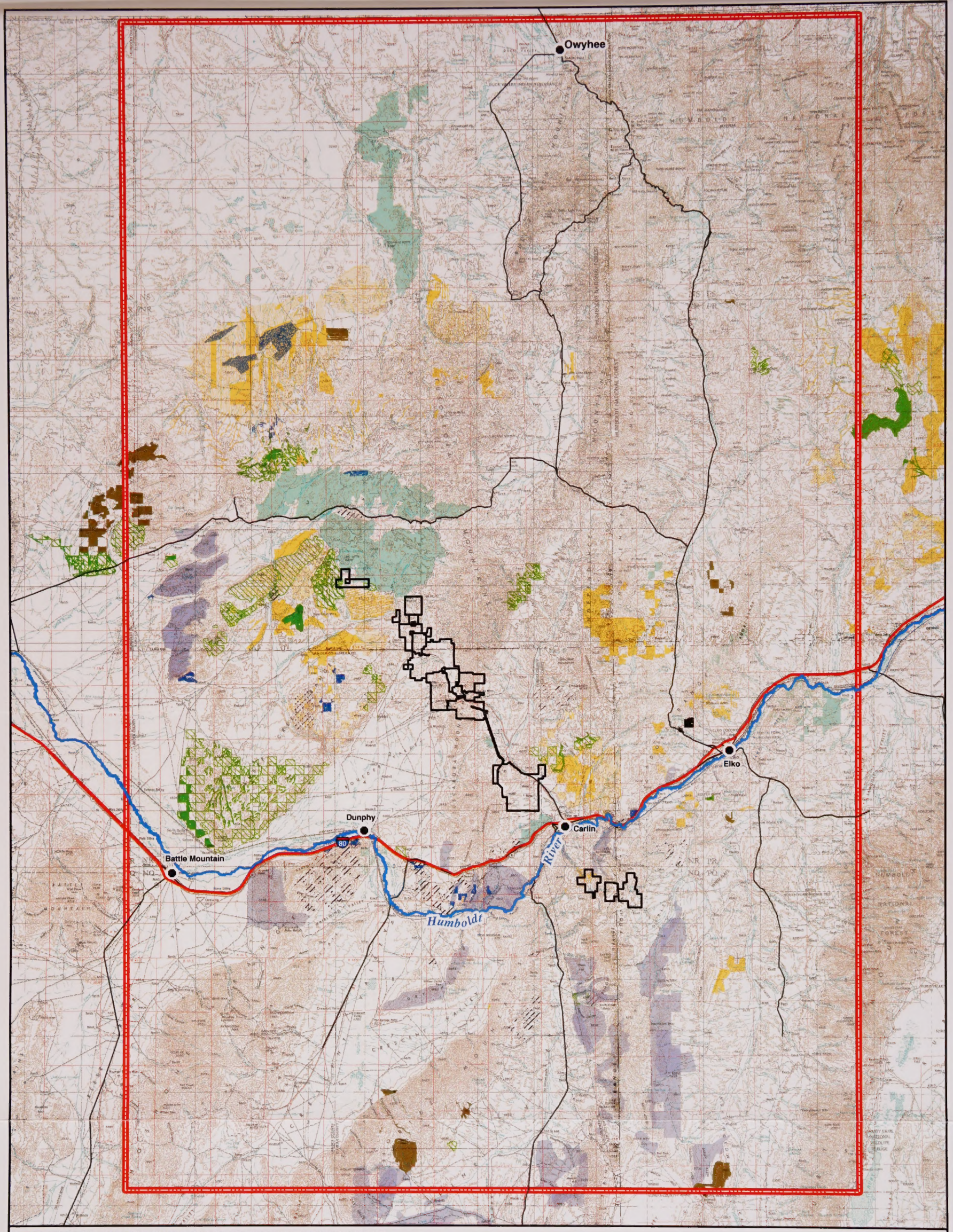


NEVADA

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

HISTORICAL FIRES - 1999 THROUGH 2008 - GENERAL CUMULATIVE EFFECTS AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-4



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N
W E
S

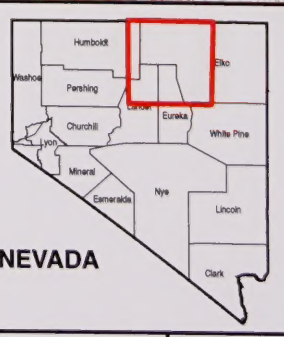
0 2.5 5 10 15
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- General Cumulative Effects Area
- Plan Boundaries

Years Reseeded

1999	2005
2000	2006
2001	2007
2003	2008



NEVADA

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

RESEEDED AREAS - 1999 THROUGH 2008 - GENERAL CUMULATIVE EFFECTS AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-5

Critical habitat areas are being reseeded with forbs, grasses, and shrubs that can compete with invasive grasses such as cheatgrass, which is prevalent in northern Nevada. NDOW is focusing its efforts on areas prioritized for wildlife values. Habitat restoration/reseeding projects from 1999 through 2008 within the Study Area resulted in reseeding a total of 382,787 acres (55,328 acres private and 327,459 acres public).

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Fire (controlled burns and wildfire) will continue to be an important component of land management for public and private landowners. Controlled burns will be used to reduce fuel load in selected areas of public land. Wildfires are expected to continue in the Study Area. Some of this acreage would likely include burning of areas previously burned and seeded.

STABILIZATION AND REHABILITATION PROGRAMS

PAST and PRESENT ACTIVITIES

Mitigation Plans

Beginning in 1991, BLM in cooperation with Barrick, Newmont, and others developed comprehensive mitigation plans for mining-related impacts. Many aspects of the mitigation plans are focused in the Carlin Trend and specifically in the Maggie, Willow, and Rock creek drainage basins; however, some mitigation projects have been implemented in other parts of the region. Key aspects of these mitigation plans are summarized below.

Barrick Conservation and Mitigation of Riparian/Wetland Areas Fund – 1991 Betze Project

The Conservation and Mitigation of Riparian/Wetland Areas Fund was established through the ROD for Barrick's 1991 Betze Project (BLM 1991). As stipulated, Barrick contributed $660,000 to an interest bearing account for the protection and enhancement of riparian and wetland areas as compensation for potential loss of up to 330 acres of riparian and wetland area predicted to occur from dewatering operations. The District Manager for the Elko District Office approves use of the funds for specific proposals developed by either BLM or Barrick in cooperation with NDOW. As of September 2008, the following projects have been approved or implemented within the Study Area:

- Evaluation of factors affecting Lahontan cutthroat trout recovery in three watersheds;
- Protection of springs and seeps;
- Squaw Valley Allotment Lahontan cutthroat trout habitat management fences;
- Culvert replacement on Beaver Creek for Lahontan cutthroat trout;
- Maggie Creek diversion replacement for Lahontan cutthroat trout;
- Susie Creek land exchange; and
- Nonnative fish barrier design for Lahontan cutthroat trout on Maggie and Susie creeks.

The ROD for the 1991 Betze Project also provided $50,000 for sage grouse habitat improvement projects including protection of riparian areas. To date, $25,000 from this fund has been expended to purchase pipe rail fencing for protection of springs in the Study Area.

Additional projects funded through the 1991 Betze ROD included Mule Deer Habitat Improvement mitigation. Mule Deer Habitat Improvement mitigation funds ($125,000) were used by BLM for seeding projects that included the Northwest Sheep Fuels Treatment Project, Rooster's Comb Seeding, Northwest Izzenhood Seeding, and browse seeding efforts on the Lander Seeding. These areas provide crucial

mule deer winter range on the flanks of the Izzenhood and Sheep Creek ranges north of Battle Mountain.

Mitigation Plan for 1993 South Operations Area Project (SOAP)

As part of the 1993 ROD for the South Operations Area Project (BLM 1993), BLM and Newmont developed a comprehensive mitigation plan (Mitigation Plan) for potential resource impacts identified through the EIS process without regard to public or private land status. The intent of the plan was to address potential adverse impacts before they occur and to improve important resources over pre-project baseline conditions.

A primary component of the Mitigation Plan was development of the Maggie Creek Watershed Restoration Project. In 1993, the BLM Elko District Office, Newmont, and the TS Ranch developed the Maggie Creek Watershed Restoration Project to enhance 82 miles of streams, nearly 2,000 acres of riparian habitat, and 40,000 acres of upland watershed in the Maggie Creek basin. The purpose of this project is to improve priority habitat for Lahontan cutthroat trout populations in the Humboldt River drainage. The project included fencing priority stream and riparian habitats, applying prescription grazing practices, water developments, and establishing a conservation easement. The project also included riparian plantings and comprehensive habitat monitoring.

Detailed discussions of the SOAP Mitigation Plan are contained in Appendix A of the Final EIS (BLM 1993). Other components of the plan include:

- Reclamation test plots;
- Fencing springs, seeps, stream segments, and livestock grazing pastures;
- Range reseeding projects;
- Stream flow augmentation plans (Maggie and Susie creeks);
- Augmentation of seeps and springs;
- Cultural resource site mitigation;
- Wildlife habitat enhancements;
- Water rights subordination;
- Contributed staff funding; and
- Resource monitoring programs.

Mitigation Plan for 2002 South Operations Area Project Amendment (SOAPA)

The SOAPA Mitigation Plan was developed as part of the 2002 ROD for SOAPA and established additions and revisions to the 1993 SOAP Mitigation Plan. Details of the SOAPA Mitigation Plan are contained in the SOAPA EIS (BLM 2002b). Components of the 2002 SOAPA Mitigation Plan include:

- Sinkhole remediation;
- Installation and monitoring three piezometers;
- Fencing springs and seeps;
- Wildlife enhancement measures;
- Construction of a wildlife friendly fence on the Stampede Ranch;
- Replacement of the Beaver Creek culvert for Lahontan cutthroat trout;
- Grazing prescription changes;
- Surface and groundwater monitoring programs; and
- Continuation of the SOAP (1993) Mitigation Plan.

Mitigation Plan for 2002 Leeville Project

The Leeville Mitigation Plan was developed as part of the 2002 Leeville Project ROD, and represents a project specific extension of the 1993 SOAP and 2002 SOAPA Mitigation Plans in addressing dewatering and dewatering related impacts. Many of the mitigation measures for potential loss of surface and groundwater flows are based on monitoring triggers. Details of the Leeville Mitigation Plan are contained in the Leeville EIS (BLM 2002a). Primary components of the Mitigation Plan include:

- Standards for construction of waste rock disposal facilities;
- Replacement of Coyote and Little Jack creek culverts for Lahontan cutthroat trout;
- Monitoring plans for refractory ore stockpiles and waste rock disposal facilities;
- Extended conservation easement for Maggie Creek Watershed Restoration Project;
- Minimize stripping operations during bird breeding season; and
- Expanded surface and groundwater monitoring.

Mitigation Plan for 2003 Betze Project

The Betze SEIS Mitigation Plan was developed as part of the ROD for Barrick's Betze Project (BLM 2003). A primary component of the Mitigation Plan was development of the Upper Willow Creek Habitat Enhancement Plan which was designed to provide mitigation for direct, indirect, and cumulative environmental effects analyzed in the Betze SEIS (BLM 2003). The area is located upstream of Willow Creek Reservoir and within the Squaw Valley allotment. The Enhancement Plan was established to restore upland and riparian conditions on approximately 12,300 acres of mostly private land in the upper reaches of the Willow Creek drainage including headwater tributaries of Nelson and Lewis creeks. Components of the Enhancement Plan include:

- Conservation easement for the Upper Willow Creek Habitat Enhancement Plan;
- Spring/seep monitoring;
- Protection and improvement of 15 seeps and springs;
- Funding ($25,000) to U.S. Fish and Wildlife Service for biota in the Humboldt River each year in which a discharge to the river occurs;
- Funding ($50,000) for sage grouse habitat enhancement and pipe rail fencing for spring protection;
- Funding ($50,000) for springsnail relocation study (Desert Research Institute); and
- Conveying 1.5 cubic feet per second (cfs) in-stream flow right to NDOW and BLM.

Mitigation for 2009 Betze Expansion Project

The Record of Decision for Barrick's Betze Pit Expansion Project (BLM 2009b) incorporated the following mitigation:

- Extension of the noxious weed management and reclamation plan.
- Barrick provided conceptual design documentation which proposes to construct the Clydesdale Waste Rock Disposal Facility in 100-foot lifts with 250-foot step-outs, allowing for an overall post-mining configuration of 2.5H:1V to 2.8H:1V slopes. Barrick will also reclaim the facility based on morphometric and hydrologic principles to resemble surrounding landforms to the extent practicable in order to minimize erosion and promote long-term stability.
- Reclamation of the eastern portion of the Clydesdale Waste Rock Disposal Facility and the western portion of the Bazza Waste Rock Disposal Facility along the wildlife migration corridor will be completed as soon as possible to minimize disturbance to the existing mule deer migration corridor.
- The haul road will be constructed with two strategically placed breaks/gaps to allow for wildlife movement while minimizing the potential for wildlife/vehicle collisions along the haul road.
- To provide a spatial buffer for Boulder, Bell, and Rodeo creeks, the Clydesdale Waste Rock Disposal Facility will be set back at least 100 feet from the uppermost edge of the creek banks.

- Limestone amendment to Betze Pit Lake - approximately 100 tons of limestone or other neutralizing material will be placed on the pit floor where the pit lake would first emerge or where ponding would occur to act as a neutralizing buffer for potential acidic runoff during the initial years of the groundwater recharge of the pit lake.

Susie Creek Riparian Restoration Project

Susie Creek has been identified as a potential reintroduction site for Lahontan cutthroat trout (USFWS 1995). Beginning in 1991, BLM, in cooperation with Maggie Creek Ranch, fenced approximately 9 miles of the lower reaches of Susie Creek for the purpose of improving stream and riparian habitat through prescriptive livestock management. Most of the remaining 13 miles of Susie Creek including several miles of tributary streams have been fenced for control and management of livestock as a result of cooperative projects between BLM, Newmont, U.S. Fish and Wildlife Service, and the Heguy and Maggie Creek ranches.

Other Projects and Programs

In addition to the mitigation plans described above, several projects and programs have been implemented to restore habitat for wildlife and riparian areas and/or manage livestock and wildlife within and adjacent to the Carlin Trend area. Primary programs and projects include the following:

Wildlife

- Carlin Trend Mule Deer Habitat Management Plan – Drafted by the Carlin Trend Mule Deer Working Group (Newmont, Barrick, NDOW, and BLM) to develop landscape scale, long term, habitat management practices to ensure maintenance or improvement of mule deer health.

- Mule Deer Transition Range Seeding - In 1997, Newmont, Elko Land and Livestock, NDOW, and BLM completed a Cooperative Agreement that developed and implemented the Bob's Flat Emergency Fire Rehabilitation and Mule Deer Mitigation Reseeding Project. Approximately 3,427 acres were seeded on public land in Bob's Flat and the southern portion of the Tuscarora Mountains through funds provided, in part, by Newmont, and placed in a mule deer habitat mitigation bank for Newmont. Seven Newmont projects totaling 1,790 acres have been withdrawn from the mitigation bank: 800 acres for the South Operations Area Project; 300 acres for the Bootstrap Project; 211 acres for Section 36 Project; 75 acres for the Lantern Project; 139 acres for the South Operations Area Project Amendment; 1-acre for the Leeville Project; and 264 acres for the Pete Project. As a result, 1,637 acres remain in the mule deer habitat mitigation bank. Application of these remaining acres would be for future projects resulting in the permanent loss of mule deer habitat for affected herds.

- T Lazy S Sage Grouse Habitat Improvements – This effort involved prescribed fire manipulation of about 275 acres of Newmont mitigation land (for SOAPA and Pete projects) within the T Lazy S Allotment to improve sage grouse habitat during fall 2005 (BLM 2006a). The same area was later aerially seeded during the winter of 2005 with a multiple grass and forb seed mixture. Newmont has also provided funding for habitat restoration on more than 8,000 acres of sagebrush habitat (Governor's Sage Grouse Conservation Team 2001).

- BLM completed a 709-acre mule deer habitat improvement project in the Sheep Creek Range north of Battle Mountain in February 2006. The project

was funded by Marigold Mining Company (formerly Glamis Dee Gold Mine Company), which provided $25,000 in funds toward the treatment on public land as mitigation for impacts to mule deer and pronghorn antelope habitat.

- Mining companies and NDOW have worked together since 1990 to implement a regulatory program to prevent wildlife mortality at heap leach ponds and mine tailing (e.g., Industrial Artificial Pond Permit program). Industrial Artificial Pond Permits require controls including: fencing to prevent access by terrestrial wildlife; covering/containment for process solution ponds to preclude access by birds and bats; and chemical neutralization or isolation of chemical-laden fluids in a pond too large to cover or contain.

- NDOW relocated approximately 350 antelope and held emergency antelope and mule deer hunts to reduce herds to sustainable levels. Critical areas for affected wildlife are being reseeded with forbs, grasses and shrubs that can compete with invasive grasses such as cheatgrass.

Fisheries and Aquatic Resources

Trout Unlimited Strategies for Restoring Native Trout Program – Maggie and Willow/ Rock Creek Drainages

In 2001, Trout Unlimited (2007a) introduced the "Strategies for Restoring Native Trout" program to scientifically monitor cooperative, large-scale restoration efforts to improve and expand existing aquatic habitat for native trout. The Maggie and Willow/Rock creek drainages were incorporated into the program in response to large-scale restoration projects being implemented through mine mitigation plans (described above). As part of the work in the Maggie and Willow/Rock creek basins, Trout Unlimited is monitoring Lahontan cutthroat trout populations annually to track progress of restoration efforts including application of prescriptive grazing management and replacement of culvert barriers. Other project partners including BLM, Newmont, Barrick, and NDOW monitor riparian and upland conditions, aquatic habitat, and water quantity and quality.

Open Range Consulting - Evaluation of Factors Affecting Lahontan Cutthroat Trout in Three Watersheds

Since 2006, the BLM Elko District Office has been working with Open Range Consulting, Inc. and other partners to develop innovative strategies for monitoring and evaluation of mine mitigation restoration efforts in the Maggie and Willow/Rock creek basins. Partners include Newmont, TS Ranch, Barrick, Squaw Valley Ranch, Maggie Creek Ranch, USFWS, Trout Unlimited, and NDOW. Specific goals of the project are to: 1) evaluate effectiveness of large scale watershed restoration efforts for Lahontan cutthroat trout; 2) correlate aerial imagery to field measurements; 3) create software to evaluate and quantify fisheries habitat; and 4) use the information to guide regional trout recovery efforts. The Project was completed in fall of 2008, and BLM received a final report in February 2009.

Beaver Creek Riparian Pasture

The Beaver Creek drainage includes approximately 30 miles of habitat for Lahontan cutthroat trout on both public and private land. In 1992, the Nevada Mining Association, in cooperation with BLM and the 26 Ranch, constructed approximately 4 miles of fence in the headwaters resulting in creation of a 10,000 acre riparian pasture. A combination of rest from livestock and limited hot season grazing since 1993 has resulted in growth and

establishment of an aspen/willow riparian corridor and improved habitat for fisheries and aquatic resources.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Fisheries and Aquatic Resources

Programs to improve stream and riparian habitat through improved livestock grazing management practices are expected to increase in the Study Area. These programs are expected to result in improvements to fisheries and aquatic resources, including threatened, endangered, and candidate species.

Wetlands and Riparian Areas

Restoration of riparian areas and programs to increase habitat for mule deer, sage grouse, and other wildlife are expected to continue in the future. Many of these programs are implemented by mining companies to offset losses of habitat that could occur as a result of operations and mine development. Other programs are implemented to restore vegetation and habitat in areas impacted by fire.

The Barrick 15 Spring Improvements project was identified as part of Barrick's mitigation commitment in the 2003 Betze Project SEIS and would restore up to 15 spring riparian sites by constructing protective fencing around seeps and springs (BLM 2006a).

RECREATION

PAST and PRESENT ACTIVITIES

Outdoor recreational areas and facilities in the vicinity of the Carlin Trend include those managed by BLM, Nevada Division of State Parks, U.S. Forest Service (USFS; Humboldt-Toiyabe National Forest), USFWS, Bureau of Indian Affairs (BIA), and private operators. These areas and facilities are described in the Leeville EIS (BLM 2002a) and shown on **Figure 2-6**.

Public land within these areas provide diverse recreational activities, including fishing, sightseeing, hunting, cross-country skiing, horseback riding, white-water rafting, photography, rock-hounding, and off-highway vehicle use. The majority of public land in the Carlin Trend has been designated as "open" for off-highway vehicles.

Recreational use of public land in the vicinity of mining operations in the Carlin Trend consists primarily of off-highway vehicle use and hunting. The area is hunted for deer, antelope, and upland game birds.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

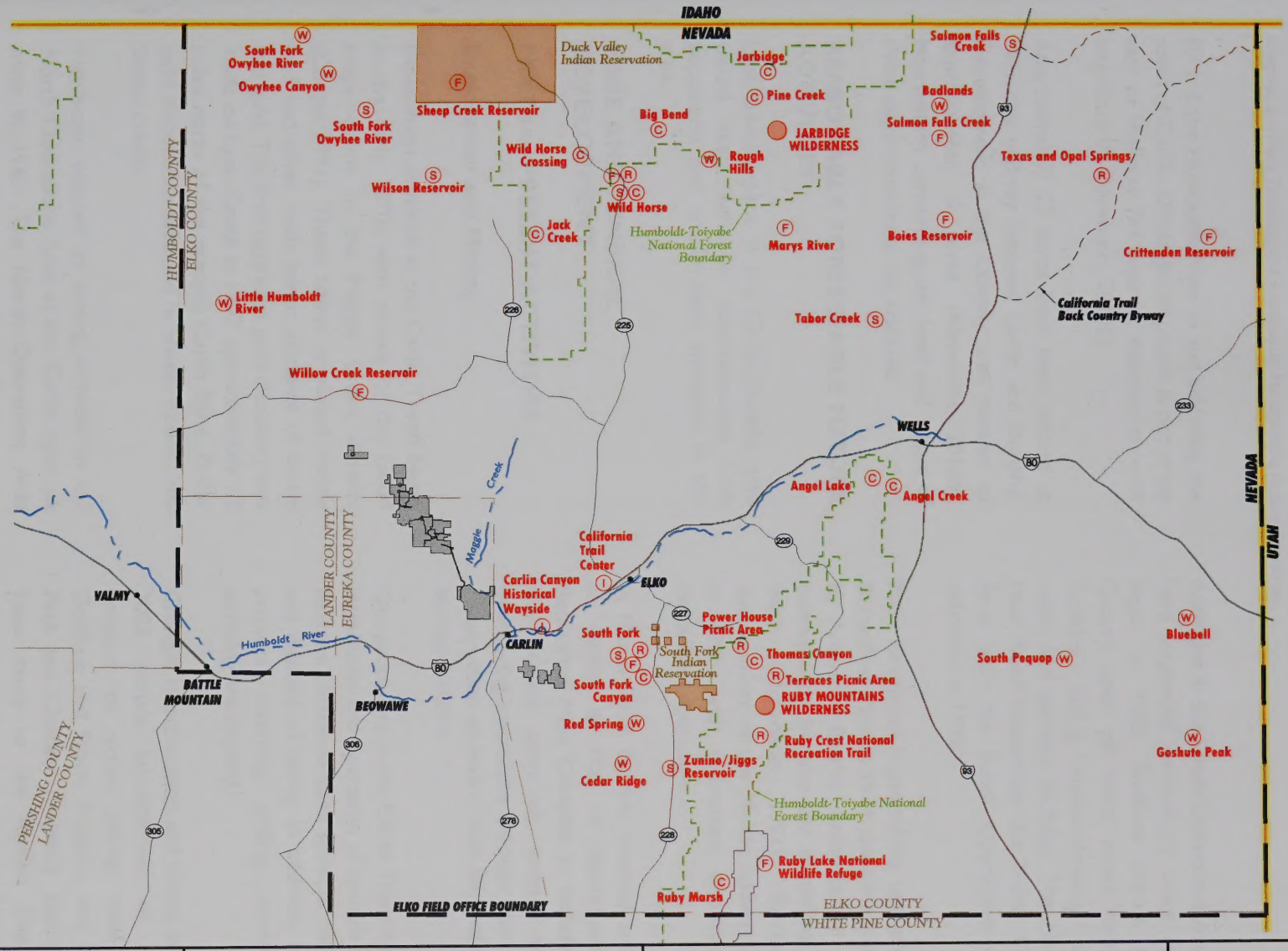
The two primary recreational activities occurring in the vicinity of Carlin Trend are off-highway vehicle use and hunting. These activities would likely continue at current levels through the foreseeable future.

BLM is currently building a California trail interpretive center located at the Hunter exit on Interstate 80, about 6 miles west of the town of Elko. The center encompasses 40 acres and includes a building, access road, interpretive plaza, 65-car parking lot, 1.5-mile walking trail, amphitheater, and day use area. BLM estimates approximately 65,000 people/year will visit the center once all exhibits are in place by 2010 (Jamiel 2007).

LAND DEVELOPMENT

PAST and PRESENT ACTIVITIES

Approximately 565 acres have been platted for development in the vicinity of Carlin. The majority of platted area lies between Interstate



Sources
1. Bureau of Land Management 2004
2. Humboldt-Toiyabe National Forest 2004
3. Nevada Division of State Parks 1992

h:\Newmont Leefille--SOAPA SEIS\5000 GIS\cad\Recreate.dwg

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

- Ⓘ Interpretive Site
- Ⓒ Campground
- Ⓕ Fishing Area
- Ⓡ Recreation Area
- Ⓢ Special Recreation Management Area
- Plan Boundaries
- Ⓦ Wilderness Study Area
- Wilderness Area

RECREATION AREAS
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-6

80 and the Humboldt River in and adjoining the town of Carlin. Other development is occurring east of Highway 766 near its intersection with Interstate 80 (Newmont 2010b).

Approximately 23 acres have been platted at Palisades, midway between Carlin and Dunphy. Development in the Dunphy area consists of approximately 6 acres (Newmont 2010b). Information concerning the level and stages of these developments is not available.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Land development in the Carlin-Dunphy area would likely continue commensurate with population and employment increases in the area.

MINE AND MINERAL DEVELOPMENT

PAST and PRESENT ACTIVITIES

Exploration and Mining

Exploration activities in the Carlin Trend began in the early 1870s with staking of the Good Hope claims in the Maggie Creek District (Coope 1991). These claims produced mainly lead and silver, with minor amounts of barite and gold. The first significant gold discovery was made on Lynn Creek in 1907, approximately 1.5 miles north of the present Carlin Mine. Placer gold discoveries followed in Sheep, Rodeo, and Simon creeks.

Newmont initiated its mining activities in the North Operations Area at the Carlin open pit mine in 1965. The North Operations Area includes the North Area Leach Pad, and the Bootstrap, Bluestar-Genesis, Lantern, Carlin, Pete, and Bullion Monarch open pit mines, and the Leeville underground mine.

Activities in the South Operations Area Project have expanded periodically since production began in 1985. Facilities include the Gold Quarry open pit mine, waste rock disposal facilities, tailing impoundments, dewatering wells, and ancillary facilities. The North-South Haul Road connecting the North Operations Area with the South Operations Area was approved in 1993.

Polar Resources began mining operations at the Betze/Post Mine in 1974; the mine was acquired by American Barrick Resources in 1986 and subsequently became the Betze/Post open pit mine (McFarlane 1991). Barrick began development of the Meikle underground mine in 1995, with processing occurring at the Betze/Post operation.

In March 2009, Barrick received authorization to amend its Plan of Operations for the Betze/Post Mine Complex to include enlarging the existing open pit, extend mining and dewatering operations through year 2015, and construction of waste rock disposal and tailing storage facilities.

Ore processing in the Carlin Trend has included installation and operation of cyanide heap leach facilities, carbon-in-leach systems, milling of ore, and disposal of tailing. In addition, exploration projects involving drilling, trenching, and sampling are ongoing.

Changes in exploration and mining activity since 2002 include advancement of exploration projects to active mining level (Barrick's Goldbug and Storm Projects, and Newmont's Pete and Chuckar Projects). Expansions have been made to the Known Deposit Areas (Newmont's North Lantern and Lantern #3 and Barrick's Dee Mine area).

Disturbance associated with each mine is shown in **Table 2-1**. The 453 acres of disturbance associated with the Leeville Project represents 1.5 percent of the past and present mining related disturbance in the Carlin Trend. Areas of past and present mining and exploration activities in the Carlin Trend are shown on **Figure 2-7**.

Sand and Gravel Operations

Approximately 395 acres of private land have been disturbed by sand and gravel operations in the Carlin area. These operations generally lie adjacent to major transportation routes (Interstate 80 and State Highway 766) in the area and have been used to support construction and maintenance of area roads over an extended period of time (Newmont 2010b).

Reclamation

In concert with mining activity in the Carlin Trend, several hundred acres of land have been reclaimed in response to cessation of active mining. A total of 1,920 acres of land have been reclaimed in the Carlin Trend, of which reclamation bond has been released on 833 acres (including 756 acres associated with the Marigold Mining/Glamis Dee Gold Mine released in November 2008). The remaining acreage is pending review for bond release. The following projects have requested bond release:

- Newmont - Bootstrap Mine – 895 acres
- Newmont - Gold Quarry SOAP – 192 acres

Dewatering and Discharge

Mining operations in the Carlin Trend have advanced to depths that require lowering the regional groundwater table to limit inflow to mine pits. Each of the major mine developments have installed dewatering wells and discharge systems to ensure mining can proceed without groundwater inflow into open pits and underground workings. Dewatering in the Carlin Trend has been ongoing for approximately 20 years.

Maggie Creek Basin

Newmont's South Operations Area Project is the only mining operation with dewatering and discharge activities in the Maggie Creek Basin. The Gold Quarry Mine currently pumps water at a rate of about 14,000 gpm or 22,500 acre-feet per year (af/yr). Of this amount, approximately 5,000 af/yr are used in mine operations (e.g., makeup water in ore processing or dust control); 200 af/yr are pumped to Maggie Creek Reservoir for storage during times of high runoff in Maggie Creek; 8,400 af/yr are used to irrigate the Hadley Fields west of lower Maggie Creek during the growing season; and 8,900 af/yr are discharged directly to Maggie Creek. Newmont has implemented the Maggie Creek Basin Monitoring Plan to monitor effects of dewatering at Gold Quarry on surface water and groundwater (Newmont 1992).

In November 1993, BLM adopted the SOAP Mitigation Plan (BLM 1993). Measures included in the SOAP Mitigation Plan and subsequent revisions to the Mitigation Plan for SOAPA (BLM 2002b) address potential adverse impacts from dewatering without regard to whether they occur on public or private land. Measures in the Mitigation Plan that deal directly with dewatering include groundwater monitoring and reporting protocols. Monitoring data are used to trigger implementation of mitigation measures found in the Mitigation Plan, including flow augmentation for individual springs, seeps, and streams.

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE MINING ACTIVITIES - CARLIN TREND IN NEVADA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-7

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig_2-1_Development.mxd

TABLE 2-1
Past and Present Mining and Exploration Related Disturbance[1]
Carlin Trend

Map Reference No.[2]	Facility	Existing Disturbance (acres)		
		Pre – 2002	2002 - 2009	Total
Mining Operations				
1	Newmont/Rodeo Creek Gold-Hollister	268	0	268
3	Halliburton-Rossi	224	149	373
6	Barrick-Storm Underground	-	185	185
8	Marigold – Dee Mine	802	-	802
10	Newmont-Bootstrap	1,900	-	1,900
11	Barrick-Betze/Post, Meikle, Rodeo, Goldbug, (Mill & TSF transferred from Newmont)	7,882	1,180	9,062
12	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch	1,775	1,183	2,958
	Newmont-North Area Leach	494	932	1,426
	Newmont-Carlin Mine/Mill 1, Pete	1,598	2,075	3,673
13	Newmont- Leeville	-	566	566
17	Newmont- Gold Quarry/SOAP, MC Reservoir, N-S Haul Road	8,641	1,320	9,961
19	Newmont-Rain	954	7	961
Subtotal		**24,538**	**7,597**	**32,135**
Exploration				
1	Rodeo Creek Gold	15	-	15
2	Hecla - Hollister Development Block	-	51	51
4	Trio Gold Corp-Rodeo Creek	-	42	42
5	Barrick-Meridian JV-Rossi	51	-	51
9	Centerra -Ren	30	-	30
11	Barrick-Goldstrike Project	233	-	233
12	Newmont -Carlin	255	-	255
14	Newmont- Chevas	168	-	168
15	Newmont-High Desert	164	-	164
16	Newmont -Mike	48	-	48
18	Newmont- Woodruff Creek	66	-	66
20	Newmont-Emigrant Springs	63	92	155
Subtotal		**1,093**	**185**	**1,278**
TOTAL		**25,631**	**7,782**	**33,413**

[1] Projects permitted by BLM as of March 2009.
[2] See **Figure 2-7** for disturbance sites.
Source: BLM 2010a.

Boulder Valley

Dewatering rates at Barrick's Betze/Post pit and underground Meikle Mine will range from approximately 14,500 gpm in 2009 to 10,500 gpm in 2015. Dewatering is conducted in accordance with the existing water management plan. After cessation of active mining in 2015, it is anticipated that the mine would dewater at a rate of about 2,000 gpm for an additional 10 years (2025) while it completes milling of stockpiled ore. Water not used for mine operations is conveyed to the TS Ranch Reservoir, Boulder Valley irrigation projects, Boulder Valley reinjection system, Sand Dune drainage and evaporation network, and/or discharged to the Humboldt River (BLM 2009b).

Newmont's Leeville Project was approved in 2002 to develop an underground mine and associated mine dewatering system (18-year projected life). Dewatering rates in 2009 averaged about 13,400 gpm or 21,535 af/yr, of which 1,200 af/yr are used for mine operations and the remainder discharged to the TS Ranch Reservoir and Boulder Valley irrigation projects (Newmont 2010a).

In 2005, Hecla Mining Company was permitted to construct and dewater an underground decline at the Hollister Development Block Exploration Project, located at the northernmost end of the Carlin Trend within Boulder Valley. Rodeo Creek Gold Co. currently operates the Hollister Development Block exploration project. Groundwater entering the exploration decline is pumped from mine sumps to the surface and discharged into a primary water management recycle pond with a capacity of 1.4 million gallons. The recycle pond is used for storing decline water for reuse in the underground drilling program, underground dust control, and fire suppression. Excess water, beyond the working capacity of the surge pond and project water needs, is pumped via a pipeline to a holding tank and two rapid infiltration basins located on an alluvial terrace near the confluence of Little Antelope Creek and Antelope Creek, approximately 5 miles from the portal. Dewatering associated with the exploration decline development has averaged 900 to 1,000 gpm during its operation.

Humboldt River

Current mine discharges occur to the Humboldt River from the Gold Quarry Mine (via Maggie Creek). This discharge was evaluated by BLM in the "Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project" (CIA) (BLM 2000). The Lone Tree Mine was also evaluated in that report; however, the Lone Tree Mine is not included in this Final SEIS because it no longer pumps groundwater or discharges to the Humboldt River.

Refractory Ore Processing

Newmont Mining Corporation and Barrick Gold Corporation operate refractory ore processing mills at their operations located at the Gold Quarry Mine and the Betze-Post Mine respectively. These facilities operate ore roasters or autoclave processes that use heat to liberate sulfide minerals from refractory or sulfidic ore thereby allowing efficient recovery of gold from the ore using standard cyanide extraction methods. In the process of removing sulfide minerals through this process, mercury contained in the ore is also removed and captured to minimize release of mercury to the environment.

Mercury Emissions

The USEPA has not established a National Emission Standard for Hazardous Air Pollutants (NESHAPS) for mercury emissions from gold ore processing facilities. Mercury is not

considered a primary pollutant, and no National Ambient Air Quality Standards (NAAQS) have been established under the Clean Air Act.

Mercury emissions from Newmont's Gold Quarry Mill 5/6 and Barrick's Betze/Post operation are shown in **Table 2-2**.

TABLE 2-2
Mercury Emissions from Carlin Trend Mining Facilities, 2006 - 2008

Facility	Tons Ore Processed Annually (Mt)	Annual Hg Emissions (lbs)		
		2006	2007	2008
Newmont Mill 5/6	12.0	210	504	422
Barrick Goldstrike	12.9	616	708	166
TOTAL	**24.9**	**826**	**1,212**	**588**

Mt = million tons; Hg = mercury; lbs = pounds.
Source: NDEP 2009a.

The TS Power Plant, located in the Boulder Valley, became operational in 2008. Mercury emissions associated with that facility are regulated by NDEP. Mercury emissions from the plant total less than 35 pounds/year.

Particulate Matter (PM) and Gaseous Emissions

Air quality in Nevada is regulated under primacy of the Nevada Division of Environmental Protection (NDEP). NDEP defines air basins as those hydrographic basins where regulated emission sources are located. Air basins that comprise the cumulative effects study area for air resources are described in Chapter 3.

Particulate matter in the 10 micron size faction (PM_{10}) is currently regulated under the Nevada Air Quality standards at mine projects. PM_{10} particles are in the respirable size range for humans and are typically associated with fugitive dust and engine exhaust. Controlling PM_{10} is required for stationary sources such as mills, crushers, and diesel-powered generator sets. Mobile equipment (e.g., loaders, haul trucks, light vehicles) are not regulated under current regulations. Fugitive dust from wheel traffic is controlled as a condition of air quality permits (road watering or chemical binding agents).

Within the cumulative effects study area, the only monitoring of PM_{10} concentrations in the study area is located in the town of Elko. Results of that monitoring indicate mean concentration of PM_{10} values remain within the ambient air quality standard of 50 micrograms per cubic meter ($\mu g/m^3$) on an annual basis and 150 $\mu g/m^3$ on a 24-hour basis. Ambient monitoring of gaseous emissions at the SOAPA and Betze/Post mine projects is not required under the air quality permits. No violations of air quality permits have been issued by NDEP to date for any mine activities in the Study Area.

Gaseous emissions regulated by NDEP include nitrous oxide (NO_x), carbon monoxide (CO), and sulfur dioxide (SO_x). Emission sources for these constituents at mine projects are typically associated with equipment engine emissions (diesel-powered mining equipment). Because the sources of these regulated constituents are mobile, no air quality permit is required.

The U.S. Environmental Protection Agency has proposed to set the primary standard for ozone between 0.060 ppm and 0.070 ppm measured over 8 hours to protect human health and safety and a secondary standard within the range of 7 to 15 ppm to protect plants and trees (EPA 2010). Mining and ore processing within the Study Area would have no effect on ozone levels.

Carbon Dioxide

Carbon dioxide (CO_2) is not a regulated gas; however, recent court rulings have directed BLM to consider the amount of CO_2 that is produced for activities that are regulated by BLM. CO_2 emission sources in the Carlin Trend include energy production (TS Power Plant), mining equipment consumption of fuel, and milling and ore processing operations associated with beneficiation of ore. No data is available to quantify the amount of CO_2 that has been generated during mining that began in the early 1980s. Based on the most recent year for which data has been published (NDEP 2008), the TS Power Plant emitted approximately 1.4 million metric tons of CO_2 equivalent ($MMtCO_2e$) to the atmosphere. Mining and ore processing in the Carlin Trend represents about 3.5 percent of total CO_2 emissions (56.3 $MMtCO_2e$) from all sources in Nevada (NDEP 2008).

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Exploration and Mining

Mine development and exploration projects are expected to continue in the foreseeable future in the Carlin Trend. Operations include Newmont's Emigrant Project, expansion of the Gold Quarry pit (Greater Gold Quarry) and the 5/6 Tailing Storage Facility, and expanded operations in the Genesis-Bluestar Operations Area. Newmont's proposed Emigrant Mine Project would include an open pit mine, heap leach facility, waste rock dumps, and ancillary facilities located about 10 miles south of Carlin. Expansion of the Genesis-Bluestar Project would involve backfilling mine pits, vertical expansion of waste rock disposal facilities, and development of the Bluestar Ridge pit. As of this date, Newmont has not submitted a proposed Plan of Operations for expansion of the Gold Quarry pit and associated construction of the 5/6 Tailing Storage Facility.

BLM has also received proposed Plans of Operations for underground mining at Rodeo Creek Gold Co.'s Hollister Development Project and Barrick's Arturo open pit mine. Reasonably foreseeable mining operations in the Carlin Trend from 2010 through 2020 are shown on **Figure 2-7** and detailed in **Table 2-3**.

Reclamation

In conformance with approved plans of operation, mining operations would continue to reclaim land disturbed for mine development. Reclamation plans provide for removal of mine infrastructure (*i.e.*, mill buildings, pipelines, roads, and office and warehouse complexes); regrading spent ore piles and waste rock piles; replacement of topsoil; and revegetation. Reclamation must meet acceptance of regulatory agencies prior to release of financial assurances.

Reclamation of mine related disturbances in the Carlin Trend will be incremental as various operations reach the end of active mining and begin closure activities. Based on the current approved disturbance acreage in the Carlin Trend (approximately 33,500 acres), approximately 7,800 acres would remain as open pits. Once dewatering activity ceases, some of the pits would form pit lakes from reestablishment of the groundwater table (*e.g.*, Gold Quarry and Betze/Post mine pits).

Allowing for some infrastructure that could remain to support post-closure sustainable opportunities such as industrial parks or training facilities, approximately 25,700 acres would be reclaimed to approved post-mine uses in the reasonably foreseeable future. Reclamation involves use of an approved seed mix that includes native and introduced species of grasses, forbs, and shrubs to establish sustainable vegetative communities beneficial to livestock grazing and wildlife habitat.

TABLE 2-3
Reasonably Foreseeable Mine Development
Carlin Trend
2010 – 2020

Map Reference	Facility	Estimated Disturbance (acres)	Comment
1	Rodeo Creek Gold - Hollister	124	Foreseeable underground gold mine and facilities. Same location as the Hollister Development Block Project. Hollister Development Block Project would go from underground exploration to underground mining operation.
3	Halliburton-Rossi Mine	584	Rossi mine expansion of Queen Lode and Sage Hen areas and may include expansion of open pits and waste rock dumps.
		100	Increase acreage for surface exploration.
7	Barrick-Arturo	2,347	Foreseeable future open pit gold mine. Development of a new open pit mine at the existing Dee Gold Mine.
9	Centerra-Ren	100	Foreseeable underground mine.
12	Newmont-North Area Leach Facility	100	Reasonably foreseeable future activities include the expansion of the heap leach pad.
	Newmont-Genesis Project	43	Continued mining of the Genesis Area. Project includes open pit mining, sequential backfill and increased height of existing external waste rock facilities.
16	Newmont-Mike	100	Foreseeable future gold mine project.
17	Newmont-South Waste Rock Disposal Facility	100	Expansion of Non-property Leach Pad and construction of Property Pad 2 in Section 18.
	Greater Gold Quarry	1,424	Gold Quarry Pit Expansion
	5/6 TSF East Expansion	782	Tailing Storage Facility (TSF) expansion
20	Newmont-Emigrant	1,418	Proposed open pit mine, sequential backfilling, heap leach pad facility and waste rock dump; permitting in progress.
TOTAL		**7,222**	

* Reasonably foreseeable assumes 100 acres disturbance per plan or plan amendment. Actual disturbance will vary as plans are developed.
Source: BLM 2010a

Dewatering and Discharge

Maggie Creek Basin

Gold Quarry Mine – Newmont's South Operations Area Project is the only mining operation in the Carlin Trend that discharges water to Maggie Creek. Mining, ore processing, and pit dewatering are projected to continue at the South Operations Area through mine life. Projected dewatering rates for the Gold Quarry Mine would be a maximum of 23,000 gpm (HCltasca 2009).

Boulder Valley

Newmont has submitted an amendment to its Plan of Operations for the Genesis Bluestar pit which would include installation of up to 35 drains and ten wells to dewater isolated groundwater zones in the Genesis pit east highwall. A maximum dewatering rate of 250 gpm is predicted.

Hollister Development Block - A Plan of Operations has been submitted to and is under review by BLM for Rodeo Creek Gold's Hollister Development Block. Based on the current Plan of Operations for the proposed operation, mine dewatering is predicted at rates up to 1,500 gpm with a cumulative discharge volume of approximately 2,400 af/yr.

Leeville Mine – Projected dewatering rate for Nemont's Leeville Mine is a maximum of 20,000 gpm (2008-2010) reducing to approximately 9,000 gpm to end of mine life (HCltasca 2009).

Humboldt River

The Humboldt River would continue to periodically receive flow from dewatering activities associated with ongoing and future mine projects in the Carlin Trend. Contribution of water from these sources would diminish over time as projected dewatering rates are expected to decrease. Groundwater models have been used to predict potential effects on base flow conditions for the Humboldt River and tributary streams resulting from mine dewatering and discharging (see Chapter 3 - *Water Quantity and Quality*).

Air Emissions

Levels of gaseous emissions and PM_{10} are expected to continue at levels similar to existing conditions. Equipment and manpower would be shifted from mine areas where ore sources are becoming exhausted to areas where new or expanded development is becoming active. No major increase in equipment or labor has been identified to support future development in the Carlin Trend.

HAZARDOUS /SOLID WASTE AND HAZARDOUS MATERIALS

PAST and PRESENT ACTIVITIES

Hazardous Waste

SOAPA and Barrick/Betze currently operate as Large Quantity Generators of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). These facilities generate more than 1,000 kilograms per month of RCRA-regulated hazardous waste (40 CFR Part 260-270). All hazardous wastes currently generated at the mines are managed according to existing, approved permits or are disposed of according to local, state, or federal regulations.

Hazardous waste streams associated with mining and ore processing in the Carlin Trend are shown in **Table 2-4**. These wastes are accumulated and stored at designated sites at each mine operation and periodically transported to one of two Clean Harbors Treatment, Storage, and Disposal (TSD) facilities in Utah. All hazardous wastes are stored, packaged, and manifested in compliance with applicable federal and state regulations.

Solid Waste

All non-hazardous solid waste generated through operations in the Carlin Trend is disposed in NDEP approved Class III waivered landfills established at the mine sites.

Hazardous Materials

A compilation of hazardous materials stored in the Carlin Trend was obtained from the Nevada Fire Marshall's office and is contained in **Appendix A**. The records included in **Appendix A** are for individual facilities in the Carlin Trend and represent the annual maximum volume of these materials that are to be stored. Recent authorizations (March 2009) allowing expansion of Barrick's Betze operations will extend the use of hazardous materials at current levels. Hazardous materials used and stored on-site in the Carlin trend are shown in **Table 2-5**.

Toxic Release Inventory

In May 1997, The U.S. Environmental Protection Agency (EPA) promulgated a final rule (62 FR 23834) that added several industries to the list of facilities subject to reporting under Section 313 of the Emergency Planning and Community Right-To-Know Act, including most metal mining facilities. The Emergency Planning and Community Right-To-Know Act (EPCRA) 313 program is commonly referred to as the Toxic Release Inventory (TRI) program. Beginning in 1998, metal mining operations were required to report releases and other waste management activities involving a specific list of chemicals and compounds of those chemicals.

TABLE 2-4
Hazardous Waste Stream
Carlin Trend Operations

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Newmont Operations				
Paint-related material	Mill 6	D001, F003	Clean Harbors by Incineration	1,100 gals
Mercury PPE/debris	Mill 6	D009	Clean Harbors by HW Landfill	31,600 lbs
Spent MIBK	Assay Lab.	D001, D002	Clean Harbors by Incineration	350 lbs
Mercuric/Mercurous chloride	Mill 6	D009, D002	Air Pollution Control on Roaster in HW Landfill	42,000 lbs
Mercury Solids	Mill 6	D009	Clean Harbors by HW Landfill	4,000 lbs
Solvents	Mills, Leach	D001, F003	Clean Harbors by Incineration	1,100 gals
Hydrochloric, Sulfuric acid	Mills, refinery	D002	Clean Harbors by Incineration	5,000 lbs
Caustic solutions	Mills	D002	Clean Harbors by HW Landfill	2,000 lbs
Lab packs	Mills, Lab	Varies	Clean Harbors/varies	500 lbs
Lead-bearing waste	Assay Lab	D008	Clean Harbors by HW Landfill	25,000 lbs
Halogenated oil	Mills	F002	Clean Harbors by Incineration	3,000 gals.
Vanadium pentoxide catalyst	Mill 6	D009	Clean Harbors by Incineration	28,500 lbs
Barrick Operations				
Aerosol can waste, filters, paint filters	Property wide	D001,D005, D008, D018, D029,D035, D039, D040, F002, F003, F005	Clean Harbors by Incineration	1,440 lbs
Waste paint and related material	Property wide	D001,D004, D007, D008, D009,D039, F002, F003, F005	Clean Harbors by Incineration	1,120 lbs
Debris contaminated with used oil and tetrachloroethyne	Property wide	D039	Clean Harbors by Incineration	240 lbs
Inorganic lab waste	Lab	D008	Clean Harbors by Incineration	92.82 tons
Computer equipment	Property wide	D008	Clean Harbors/Metal recovery including retorting, smelting, chemical	17.11 tons
Baghouse dust from assay lab	Lab	D008	Clean Harbors by HW Landfill	5.07 tons

TABLE 2-4
Hazardous Waste Stream
Carlin Trend Operations

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Brick, mortar , and soil	Autoclave	D008	Clean Harbors by HW Landfill	9.59 tons
HEPA filters and debris	Processing and Refining	D008	Clean Harbors by HW Landfill	7.12 tons
Used oil	Property wide	D039, D040	Clean Harbors by Incineration	17.5 tons
Used solvent	Property wide	D001	Clean Harbors by Incineration	440 lbs
Waste lead/acid batteries	Property wide	D002, D008	Clean Harbors by other treatment	400 lbs
Lead contaminated sandblast grit	Property wide	D008	Clean Harbors by HW Landfill	4.5 tons

EPA - Environmental Protection Agency; TSDF = Treatment, Storage, or Disposal Facility; gals = gallons; lbs = pounds; PPE = Personal Protection Equipment; HW = Hazaradous Waste; MIBK = Methyl Isobutyl Ketone.
1 Laboratory Clean-out Chemical Wastes
Source: BLM 2002a; Barrick 2006; Newmont 2007a.

Included in the EPCRA Section 313 guidance, metal mining operations were required to report the amount of TRI chemical contained in waste rock placed in waste rock disposal facilities as a "release amount." The majority of TRI chemicals found in waste rock is naturally-occurring and reported as a result of handling and moving waste rock as a part of mining operations. In 2003, the District Court for the District of Columbia issued a decision in *Barrick Goldstrike Mines Inc. vs. Whitman,* (Civ. Action No. 99-958 (TPJ), which ruled that waste rock is exempt as *de minimis* and that non-persistent bioaccumulative toxins under certain percentages by weight are also exempt from TRI reporting.

Appendix B is a compilation of data available in Facility Profile Reports obtained from the EPA Envirofacts website (http://www.epa.gov/enviro/html/tris/index.html) for Barrick's Betze/Post Mine and Newmont's North and South Operations area. Additional data about these facilities and other mining operations are available on this website, including annual amounts of TRI chemicals recycled or treated on site or at remote locations. These facilities are representative of mining-related releases of EPCRA 313 regulated chemicals in Elko and Eureka counties on an annual basis. Data for Newmont's operations are included through 2008. Data for Barrick's during 2007 and 2008 were not available on the website.

EPA cautions that: "Users of TRI information should be aware that TRI data reflect releases and other waste management activities of chemicals, not whether (or to what degree) the public has been exposed to those chemicals. Release estimates alone are not sufficient to determine exposure or to calculate potential adverse effects on human health and the environment. TRI data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from releases and other waste management activities which involve toxic chemicals. The determination of potential risk depends upon many factors, including the toxicity of the

TABLE 2-5
Hazardous Materials Used and Stored
Carlin Trend

Substance	Newmont		Barrick		Rodeo Creek Gold, Inc.	
	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)
Diesel Fuel	45 Mgals.	1.3 Mgals.	16.6 Mgals.	85,000 gals.	510,000 gals.	30,000 gals.
Gasoline	730,000 gals.	30,000 gals.	376,539 gals.	10,500 gals.	7,100 gals.	5,000 gals.
Hydraulic Oil	80,000 gals.	12,000 gals.	NA	NA	2,000 gals.	500 gals.
Motor Oil	50,000 gals.	10,000 gals.	41,000 gals.	NA	2,000 gals	500 gals.
Antifreeze	40,000 gals.	8,000 gals.	45,000 gals.	27,000 gals.	3,600 gals.	220 gals.
Explosives	-	25,000 lbs.	NA	NA	115,720 lbs.	NA
Prill	40,000 tons	800 tons	18,731 tons	217 tons	8,000 lbs.	NA
Propane	1.8 Mgals.	350,000 gals.	17.5 Mgals.	2.7 Mgals.	NA	NA
Grease	80,000 lbs	50,000 lbs	NA	NA	NA	NA
Cyanide	18.2 Mgals.	75,000 gals.	10.5 Mlbs.	580,010 lbs.	NA	NA
Lime	112,354 tons	1,502 tons	290,657 tons	4,150 tons	NA	NA

Mgals. = million gallons; gals. = gallons; Mlbs. = million pounds; lbs. = pounds; NA = Not Available
Source: Newmont 2010c; Barrick 2007b. Rodeo Creek Gold 2008.

chemical, the fate of the chemical, and the amount and duration of human or other exposure to the chemical after it is released."

TRI chemicals released during the period from 1998 through 2008 provide a general indicator of the amount of TRI chemicals handled by the various mining operations in the area and to determine trends associated with recycling efforts and waste minimization at the sites in question and potential new sites planned for development.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Solid and Hazardous Waste

Reasonably foreseeable projects in the Carlin Trend would result in similar volumes of solid and hazardous wastes stored on site, transported on state and federal highways, and disposed of at approved sites. The volumes of solid and hazardous wastes transported are expected to remain at current levels (see *Past and Present Activities* and **Appendix A**).

Production levels for mills and heap leach operations are expected to be optimized for the foreseeable mine expansions and developments. As a consequence, the volume of hazardous materials transported, stored, consumed, and disposed would remain at current levels. Portions of Gold Quarry operations that remain to be built would not result in a change in the volume or type of solid or hazardous materials currently being used in SOAPA operations.

Hazardous materials that would be stored and used at the proposed Emigrant Mine and Rodeo Creek Gold are included in **Table 2-6**.

OIL, GAS, AND GEOTHERMAL LEASES

Elko District Competitive Oil and Gas Lease sales are conducted quarterly, in March, June, September, and December. Parcels proposed for lease are posted on the Nevada BLM website (www.nv.blm.gov) 45 days prior to the sale date.

Within the vicinity of the Carlin Trend, 24 tracts of land have been issued leases for oil and gas. These tracts lie within Townships 31 North to 39 North; Ranges 46 East to 54 East. Recent oil exploration activity includes two "dry" holes; one drilled in Section 34, Township 31 North, Range 51 East in February 2008, and one in Section 16, Township 34 North, Range 54 East, which was plugged in September 2009. Two tracts have been issued leases for geothermal. The last geophysical survey for oil and gas in the Study Area was in 2006 (BLM 2010b).

PAST and PRESENT ACTIVITIES

There are currently 24 tracts of land leased for oil and gas within the Study Area. These tracts lie within the area shown on **Figure 2-8**.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

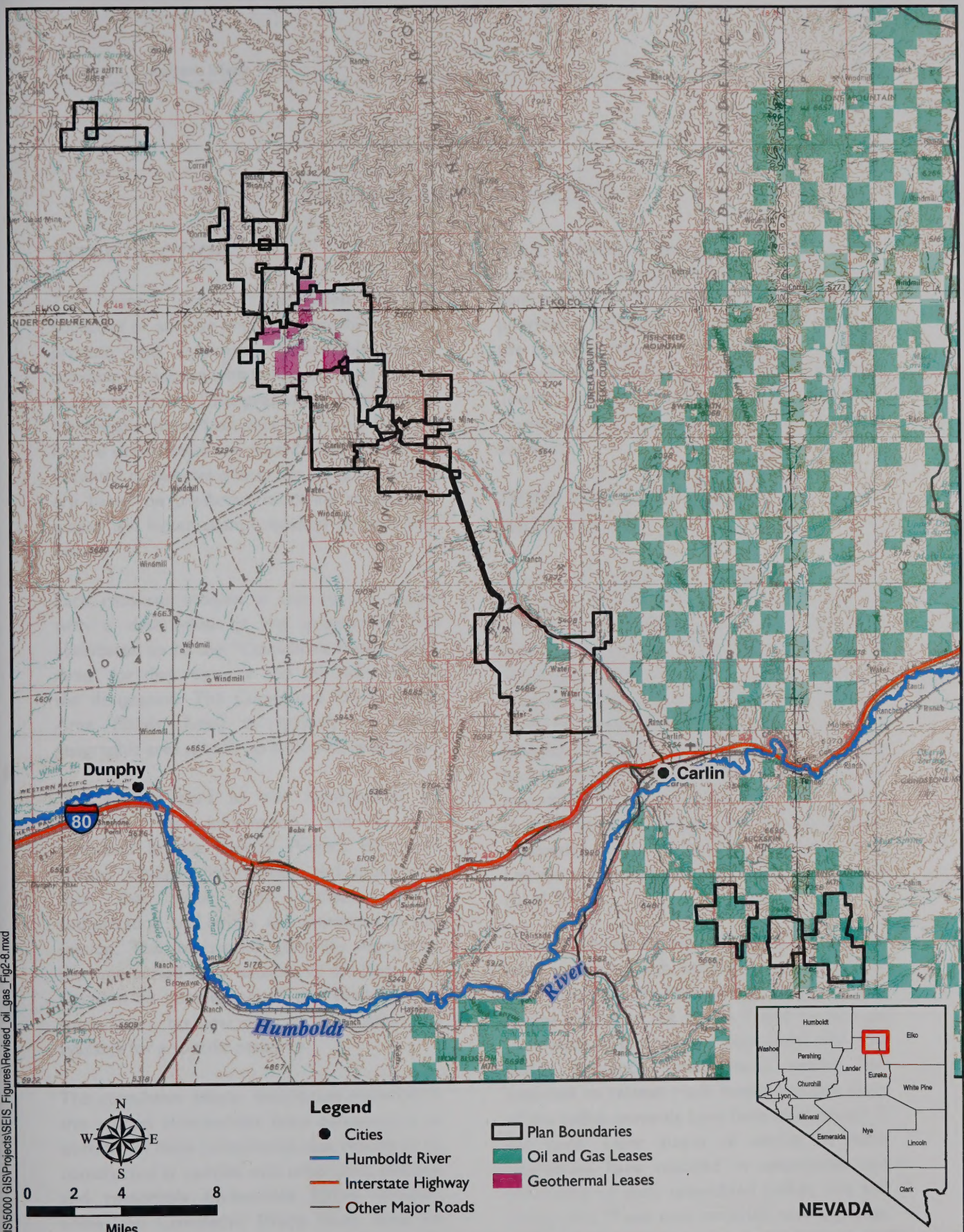
Leasing parcels is expected to continue in the future as energy demand continues to increase. No exploration or development permit applications for projects in the Study Area have been submitted to BLM. Future proposed actions may create surface disturbance, which will be analyzed when a lessee submits plans for the action (BLM 2006a).

TABLE 2-6
Hazardous Materials Management
Emigrant and Rodeo Creek Gold Projects

Substance	Area Used/Stored	Rate of Use (per year)	Quantity Stored On-site	Storage Method	Waste Management
Emigrant Project					
Diesel Fuel	Mine/truck shop	5,300,000 gals.	35,000 gals.	Bulk tank	No waste
Hydraulic Fluid	Mine/truck shop	-	5,000 gals.	Bulk tank totes, drums	Recycled
Motor Oil	Mine/truck shop	-	5,000 gals.	Bulk tank totes, drums	Recycled
Antifreeze	Mine/truck shop	-	5,000 gals.	Bulk tank totes, drums	Recycled
Explosives	Prill Silo	8,000,000 lbs.	370,000 lbs.	Silo	No waste
	Explosive (powder) magazine	50 tons	2,500 lbs.	Magazine	No waste
Gasoline	Mine/truck shop	-	5,000 gals.	Bulk tank	No waste
Propane	Mine/surface	-	5,000 gals.	Bulk tank	No waste
Grease	Mine/truck shop	-	1,000 gals.	Totes, drums	Recycled
Cyanide	Leach Pad	8,200,000 lbs.	7,000 gals.	Bulk tank	No waste
Lime	Heap Leach Facility/Lime silo	26,000 tons	250 tons	Silo	No waste
Rodeo Creek Gold (Hollister Development Block)					
Diesel Fuel	Mine/truck shop	510,000 gals.	30,000 gal.	Bulk tank	No waste
Gasoline	Mine/truck shop	7,100 gals.	5,000 gals.	Bulk tank	No waste
Antifreeze	Mine/truck shop	3,600 gals.	220 gals.	Drums	Recycled
Caustic Soda	Water Treatment & Desilting Plant	800 gals.	2,400 gals	Bulk tank	No waste
Naphia	Maintenance Shop	500 gals.	55 gals.	Drum	Recycled
Sulfuric Acid	Water Treatment & Desilting Plant	38,400 gals.	1,650 gals.	-	-
Lime	Water Treatment & Desilting Plant	20,000 lbs.	47,000 lbs.	-	-
Hydrochloric Acid	Water Treatment & Desilting Plant	800 gals.	300 gals.	-	-
Concrete Stripper (CS-141)	Surface Containment Area	55 gals.	55 gals.	Drum	-
Chemco #1-degreaser	Maintenance Shop	55 gals.	55 gals.	Drum	-
Ammonium Nitrate and Fuel Oil (ANFO)	*	*	*	*	No waste

gals. = gallon; lbs. = pounds; * = information available from Department of Homeland Security
Source: Newmont 2007bc; Rodeo Creek Gold 2008.

THIS PAGE INTENTIONALLY LEFT BLANK



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

OIL, GAS, AND GEOTHERMAL LEASE AREAS
GENERAL CUMULATIVE EFFECTS AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

2-8

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Revised_oil_gas_Fig2-8.mxd

CHAPTER 3
CUMULATIVE EFFECTS

INTRODUCTION

This chapter presents descriptions of the collective or additive impacts of combining past, present, and reasonably foreseeable future activities associated with mining and land uses in the Carlin Trend. Past, present, and reasonably foreseeable future land uses and man-made and natural occurrences are described in Chapter 2. Potential cumulative effects for some resources are based on predictive modeling results (air quality and water quantity/quality) as described below.

Each resource analysis in this section begins with a description of the geographic area considered to be the "Cumulative Effects Study Area" for that resource and the rationale for the designation. The Cumulative Effects Study Area (Study Area) is typically a unique geographic area specific to individual resources.

This analysis tiers to and incorporates by reference the information and analyses contained in the Leeville Project EIS (BLM 2002a). Updated information and monitoring data that have been collected since authorization of Leeville are presented in this section. This information generally represents the time period since issuance of the Record of Decision to compilation of this Final SEIS. In some cases, no new data or information are available for a specific resource.

The cumulative effects description provided in this section incorporates mine components or portions of mine components that remain to be constructed at Leeville with other past, present, and reasonably foreseeable future activities within the Cumulative Effects Study Area for each resource. Chapter 1 – *Project History and Status,* provides a description of the current status of the Leeville Project including mine components yet to be constructed. Chapter 2 provides a description of past and future land use activities that may have an effect on social and environmental resources within the Carlin Trend. Cumulative effects on the various resources are described in the following sections.

GEOLOGY AND MINERAL RESOURCES

Effects of mining on geology and mineral resources include the excavation and relocation of rock materials from the natural setting. Ore rock is processed in mill facilities or placed on heap leach pads and waste rock is placed in disposal facilities. In some cases, waste rock is used in construction of roads, leach pad foundations, ditch systems, stockpile areas, and backfill. Movement and disposition of rock materials in terms of volume and location varies by mine operation. Details of rock excavation, processing, and placement associated with Leeville are included in the Leeville Project EIS (BLM 2002a).

Potential release of trace metals is the primary issue associated with excavation and disposal of rock materials in the mining process. Early mining activity in the Carlin Trend focused on excavation of the oxidized rock (rock with low sulfide content). These rocks exhibit low potential to release trace metals because most of the sulfide minerals have been leached out of the rock. Later stages of mining in some operations have resulted in excavation and processing of deep unoxidized sulfidic ore and waste rock. These rock materials have a greater potential to generate acid and release trace

metals to the environment and, as a consequence, specific procedures have been implemented to manage release of trace metals from these rock types.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for geology and mineral resources is depicted on **Figure 2-7** and incorporates existing and reasonably foreseeable mining activity through 2020. The Study Area includes the Carlin Trend, which currently encompasses the proposed Emigrant Project in the southeast to the proposed Hollister Development Block in the northwest, and areas currently under lease for geothermal and oil/gas resources as shown on **Figure 2-8**.

MONITORING DATA AND NEW INFORMATION

Past and current mining and exploration operations in the Study Area have resulted in approximately 33,500 acres of surface disturbance. A total of 1,920 acres have been reclaimed in the Carlin Trend, with release of reclamation bond for 833 acres. The remaining reclaimed acreage is pending review for bond release. Approximately 7,200 acres are projected to be disturbed from 2010 through 2020 (**Table 2-3**).

Of the original proposed acreage disturbance for the Leeville Project (453 acres) approximately 350 acres have been disturbed to date. Components of the Project that have not yet been constructed or have been partially completed as of preparation of this Final SEIS include construction of three additional ventilation shafts and a refractory ore stockpile (Newmont 2010a). Details of the current status of the Leeville Project are included in *Project History and Status* in Chapter 1.

Mining operations in the Carlin Trend have developed waste rock monitoring programs. These programs require periodic sampling and analysis of waste rock generated during mining operations. This program is described in the Leeville Project EIS (BLM 2002a).

CUMULATIVE EFFECTS

Large-scale mining is projected to continue in the Carlin Trend with ongoing operations building out individual mine areas to permitted limits. Ongoing and future mine development would result in expansion to and creation of open pits; underground mines, waste rock disposal areas, heap leach pads, milling and tailing storage facilities, and the construction and operation of ore processing facilities.

Future exploration may also result in delineation of refractory ore zones that may require additional dewatering systems for economical recovery of ore. The total volume of ore, waste materials, and gold that could be economically excavated from the Carlin Trend in the future is not quantifiable as the price of gold and individual ore body characteristics dictate whether any particular ore body could be economically mined.

Topography of the area would continue to be modified as a result of mine excavation, waste rock and tailing disposal, reclamation, and other mine related surface disturbance. Construction and operation of the remaining mine components at Leeville would add incrementally to the alteration of topography and the removal of mineral resources and mine waste within the Study Area.

Continued mining may afford the opportunity to backfill mined-out pits with waste rock from future operations. Such opportunities would be judged individually and based upon accessibility as well as influence on future mining activities. Backfilling and subsequent reclamation would restore land to pre-mining uses, but backfilling may preclude access to additional or lower grade mineral resources.

Movement of overburden or waste rock and ore rock materials as a result of mining results in relocation of rock from natural emplacement to manmade waste rock disposal sites, heap leach piles, or tailing storage facilities. Rock that contains sulfides can react with oxygen and water (precipitation) to form acid that can liberate trace metals from the rock; providing that sulfides and trace metals are in sufficient concentration and form to be released via this mechanism.

Carbonaceous waste rock that contains no or low concentrations of sulfide minerals and elevated concentrations of carbonate minerals provides neutralizing and/or buffering effects on acidic leachate that may form as a result of contact with sulfide bearing waste rock. The neutralization of acidic leachate can arrest the movement of trace metals in leachate through various chemical reactions including precipitation, co-precipitation, and adsorption.

Waste rock generated in the Carlin Trend is sampled, tested, and classified in accordance with Nevada Division of Environmental Protection (NDEP) Evaluation Guidelines for Waste Rock and Overburden (NDEP 1996) to determine potential to generate acid. Waste rock is sampled and analyzed daily for heavy metals and acid-base accounting. Potentially acid-generating (PAG) waste rock identified is segregated, encapsulated, and monitored.

Development of refractory (sulfide) ore deposits in the Carlin Trend has increased the amount of PAG material stored in stockpiles and deposited in waste rock disposal facilities. Volume of PAG rock varies by mine site as depicted in **Table 3-1**. Analytical methods used to determine PAG rock also vary by mine operation and over time. Methods employed during the early stages of development in the Carlin Trend such as static testing and whole rock analyses have evolved to include a variety of kinetic testing methods currently used. Tonnages portrayed in **Table 3-1** for the Genesis-Bluestar/Lantern and Emigrant Projects reflect predictions made through a variety of analytical methods including static and kinetic testing. Tonnages reported for other mining operations listed in **Table 3-1** are based on operational monitoring methods used since inception of mining to the present day at these mine sites.

Waste rock disposal facilities and sulfide ore stockpiles are designed and constructed in a consistent manner to minimize potential for acid drainage by control of the acid generation process. In general, these procedures are based on the strategy that acid generation can best be prevented by minimizing the amount of water which contacts potentially acid generating rock. Both refractory ore stockpiles and sulfide waste rock encapsulation units are designed and constructed to limit the exposure of sulfidic material to atmospheric oxygen, groundwater, direct precipitation, snowmelt, and storm water run-on. Design and construction criteria are described in the SOAPA EIS (BLM 2002b) and Newmont's Water Pollution Control Permit (Newmont 1985).

Acid rock drainage has been observed at the Hollister Project Area and the Rain Mine Waste Rock Disposal Facility. Some acid rock drainage has been observed at refractory ore stockpiles at Newmont's South Operations Area (Gold Quarry). This drainage occurs seasonally and is not measured by Newmont, but is captured and used in ore processing. Refractory ore stockpiles will be removed after project closure and, therefore, have a relatively short-term potential for producing acid drainage. To date, with the exception of groundwater at the Hollister Project, no surface water or groundwater monitoring stations indicate evidence of acid-rock drainage within the Carlin Trend (see *Water Quantity and Quality* in this chapter).

TABLE 3-1
Potentially Acid Generating (PAG) Waste Rock as a Percentage of all Waste Rock at Carlin Trend Mines

Mine	Non-PAG Waste Rock (million tons)	PAG Waste Rock (million tons)	Total Waste Rock (million tons)	Percent PAG of Total Waste Rock
Past Activity				
Carlin Mine	NA	NA	NA	NA
Bootstrap	105	11	116	9.5
Rain	21.25	0.75	25	3
Dee	72	NA	72	NA
Present Activity				
Leeville	3.5	0.4	3.9	11.4
Storm	0.335	0.046	0.38	12
Betze/Post[2]	3,181.2	857.2	4,038.4	21
Pete	70	13	83	15.6
Genesis-Bluestar/Lantern	384.9	15.4	400.3	4
Lantern III	51	0.0	51	0
Gold Quarry[4]	681	262.9	943.9	27.8
Reasonably Foreseeable Future Activity				
Hollister	NA	1.0	1.0	100
Emigrant[1]	79	4	83	5
Genesis Project[3]	421.5	28	449.5	6
Dee-Arturo	528	72	600	12
Greater Gold Quarry[5]	699.1	114.9	814	14

NA = Data not available
[1] Proposed waste rock production - Emigrant Plan of Operations (Newmont 2007b).
[2] Includes Meikle Mine production.
[3] Proposed production - Genesis Project Plan of Operations (Newmont 2007c).
[4] Includes past production and currently authorized future production.
[5] Proposed waste rock production; POO for this project has not been submitted for agency review.
Source: BLM 2002a, 2002b, 2009b, 2009c.

Oil and Gas Production

A Reasonable Development Scenario, based on a 15-year projection, was prepared by BLM to estimate potential environmental impacts resulting from oil and gas development in the Elko Field Office area (BLM 2005a). The development scenario is based on geophysical exploration activities occurring in the area between 1954 and 1991. These dates represent the most active period of exploration in the Elko District. The last geophysical survey for oil and gas in the District was in 2000 (BLM 2005a).

Currently, 24 tracts of land have been leased for oil and gas within the Study Area as shown on **Figure 2-8**. These tracts lie within Townships 31 North to 39 North; Ranges 46 East to 54 East. Recent oil exploration activity includes two "dry" holes; one drilled in Section 34, Township 31 North, Range 51 East in February 2008, and one in Section 16, Township 34 North, Range 54 East. Two tracts have been

issued leases for geothermal. The last geophysical survey for oil and gas in the Study Area was in 2006 (BLM 2010b). The development scenario predicts an additional eight producing wells and 52 exploration (dry) wells will occur during the 15-year plan primarily in the Pine and Railroad Valley areas. These areas lie outside the Study Area for this resource.

Geothermal

No active explorations or development activities for geothermal resources are occurring within the lease areas depicted on **Figure 2-8**.

Sand and Gravel

Sand and gravel have not been sold nor permits issued for the use of sand and gravel on public land within the Study Area.

AIR QUALITY

Air pollutant sources within the Study Area include existing mining operations and other background sources. Emissions from mining include criteria air pollutants such as particulate matter (both particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$)), gaseous emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), and carbon monoxide (CO), and trace metal Hazardous Air Pollutants (HAPs) such as mercury. Background emission sources include traffic on unpaved roads, windblown dust, agricultural activities, and emissions from existing and future power generation facilities. NDEP has classified the Study Area as an Attainment Area indicating air pollution levels in the area do not exceed ambient standards.

Mining operations in the Carlin Trend are required to obtain an air quality permit from NDEP Bureau of Air Pollution Control (BAPC). These permits establish air emission levels that meet air quality standards which are protective of human health and the environment. Air quality permits for mining operations are available for public review through NDEP.

On July 18, 1997, EPA promulgated National Ambient Air Quality Standards (NAAQS) for fine particulate matter ($PM_{2.5}$), which was later revised in 2006. Particles less than 2.5 micrometers (microns) in aerodynamic diameter typically include particles from all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. $PM_{2.5}$ emissions are a subset of PM_{10} emissions, in that all $PM_{2.5}$ is included in measurements of PM_{10}. Playas (dry lake beds) in Nevada have high ambient $PM_{2.5}$ levels due to the chemical precipitate that forms on the surface.

EPA has only recently begun to adopt the necessary implementation rules to allow states to begin to review and assess $PM_{2.5}$ emissions, and has not completed the necessary rulemakings to address all requirements applicable to $PM_{2.5}$. EPA has required that each state submit a State Implementation Plan (SIP) that provides basic program elements specified in section 110(a)(2) of the Clean Air Act necessary to implement the $PM_{2.5}$ NAAQS. States were required to submit SIPs to implement the $PM_{2.5}$ NAAQS by 2008. The State of Nevada submitted the required SIP to EPA to comply with the $PM_{2.5}$ NAAQS, but as of January 2010 the EPA had not approved the SIP.

By letter dated June 26, 2009, NDEP notified regulated sources that while it would require $PM_{2.5}$ analyses for major stationary sources pursuant to the New Source Review/Prevention of Significant Deterioration (NSR/PSD) programs, it would not require such analyses for sources not subject to NSR/PSD permitting

requirements (NDEP-BAPC 2009). As the Leeville Project is not subject to these NSR/PSD requirements, NDEP has not required either $PM_{2.5}$ modeling or monitoring of the Project for air permitting purposes.

CUMULATIVE EFFECTS STUDY AREA

Cumulative impacts for air resources may result from overlap of different sources of emission located in the same general area, but not necessarily in immediate proximity to each other. The cumulative analysis discussed here includes the Leeville and SOAPA projects, Barrick Goldstrike Betze/Post operations, new TS Power Plant, and other sources of air emissions in the vicinity of the Carlin Trend.

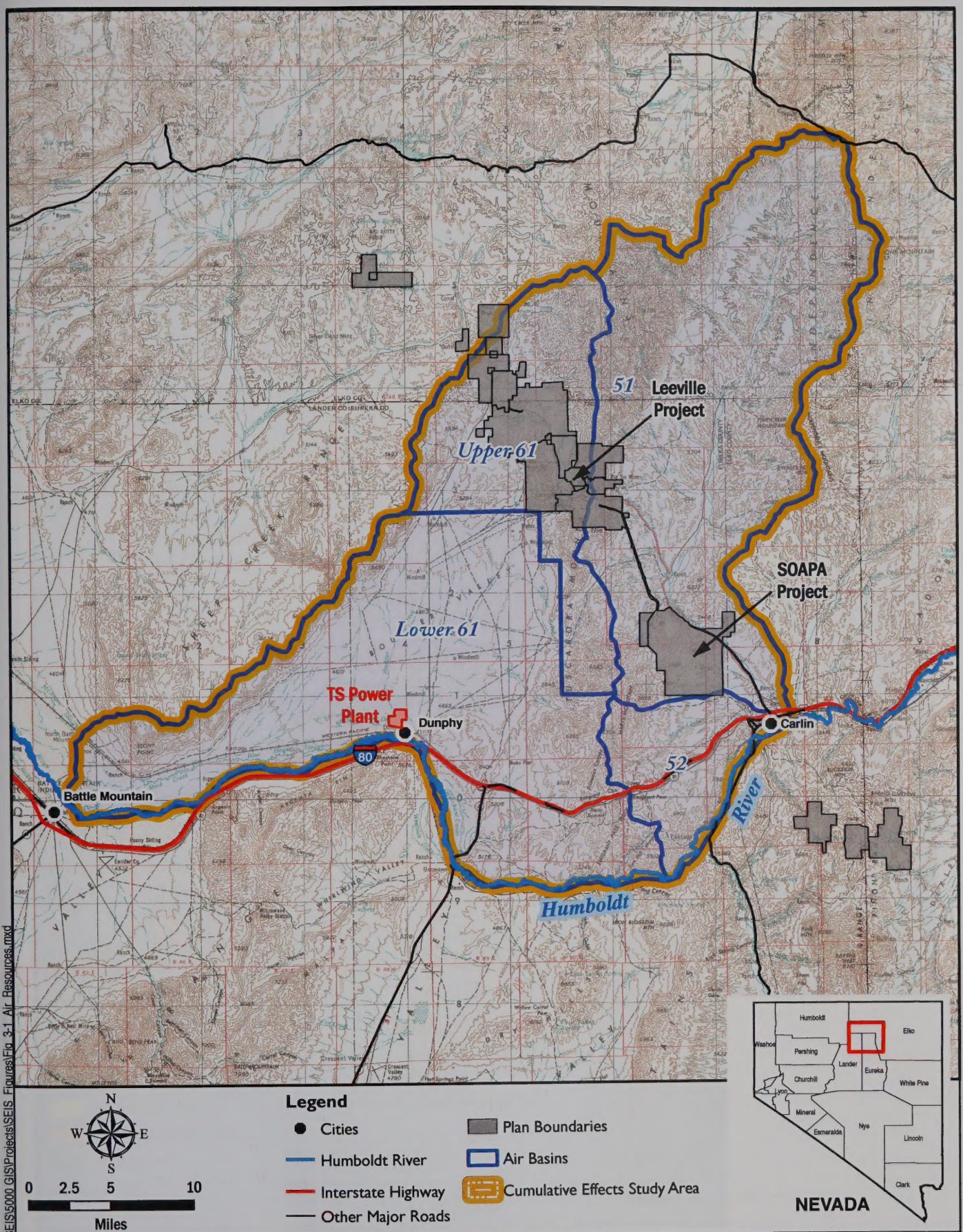
The State of Nevada has divided the state into 250 air quality planning areas based on hydrographic basins. The Cumulative Effects Study Area (Study Area) for air resources focuses on three of these basins, encompassing approximately 986 square miles. These air basins are: Basin 51 - Maggie Creek Basin; Basin 61 - Boulder Flat Basin (both upper and lower portions of this basis); and Basin 52 - Marys Creek Basin. The Leeville and SOAPA project elements are located entirely within two of these basins – Basin 51 and Basin 61. **Figure 3-1** illustrates locations of these air basins and facilities.

Rationale for selecting these air basins for the cumulative effects investigation is based on previous air quality modeling of Barrick's Betze/Post operations, Newmont's SOAPA and North Operations Area, and the TS Power Plant for regulated air pollutant sources conducted for the NDEP air quality permit process. Air modeling completed for the individual permits for these facilities has shown that, for each of these projects, air pollutant concentrations are localized near the project boundaries, and modeled air pollutant concentrations diminish rapidly with distance from project boundaries (EMA 2006, 2007a, 2007b). None of these air pollutant emission sources are located closer than 7 kilometers (km) from the outer boundaries of these three air quality basins. Based on previous air pollutant modeling, 7 km was judged to be sufficiently large that only other past, present, and reasonably foreseeable future emission sources in these three air quality basins needed to be modeled with the Leeville and SOAPA mine emission sources to determine potential for cumulative air quality impacts.

The Cumulative Effects Study Area for mercury differs from that used for evaluating cumulative effects associated with regulated pollutants (NO_x, SO_2, and CO) as described above. The study area for mercury emissions is broader and encompasses the geographic area depicted in (**Figure 3-2**). This study area was developed as a result of using EPA's Regional Modeling System for Aerosols and Deposition (REMSAD) model and reflects the cumulative effects resulting from mercury emission sources and deposition associated with mineral processing in the Carlin Trend.

Based on inquiry with NDEP, only four facilities with current permits issued by NDEP are located in air quality Basins 51, 52, or 61 (Upper or Lower), and no permit applications for other sources within these three basins were being reviewed by NDEP. The Leeville Project is part of the North Operations Area.

The North Operations Area (NOA) currently operates under Class II Air Quality Operating Permit No. 1041-0402.01 issued by NDEP. Newmont's NOA is a metal mining and processing operation that encompasses multiple mine areas (including the Leeville Mine) and facilities located approximately 24 miles northwest of Carlin (**Figure 2-7**). The NOA and Leeville Mine have no regulated emissions of NO_x, SO_2, or CO. NOA is a minor source (potential to emit less than 100 tons per year) of fine particulate matter and the Leeville Mine has a fine particulate matter potential to emit less than 1 ton per year.

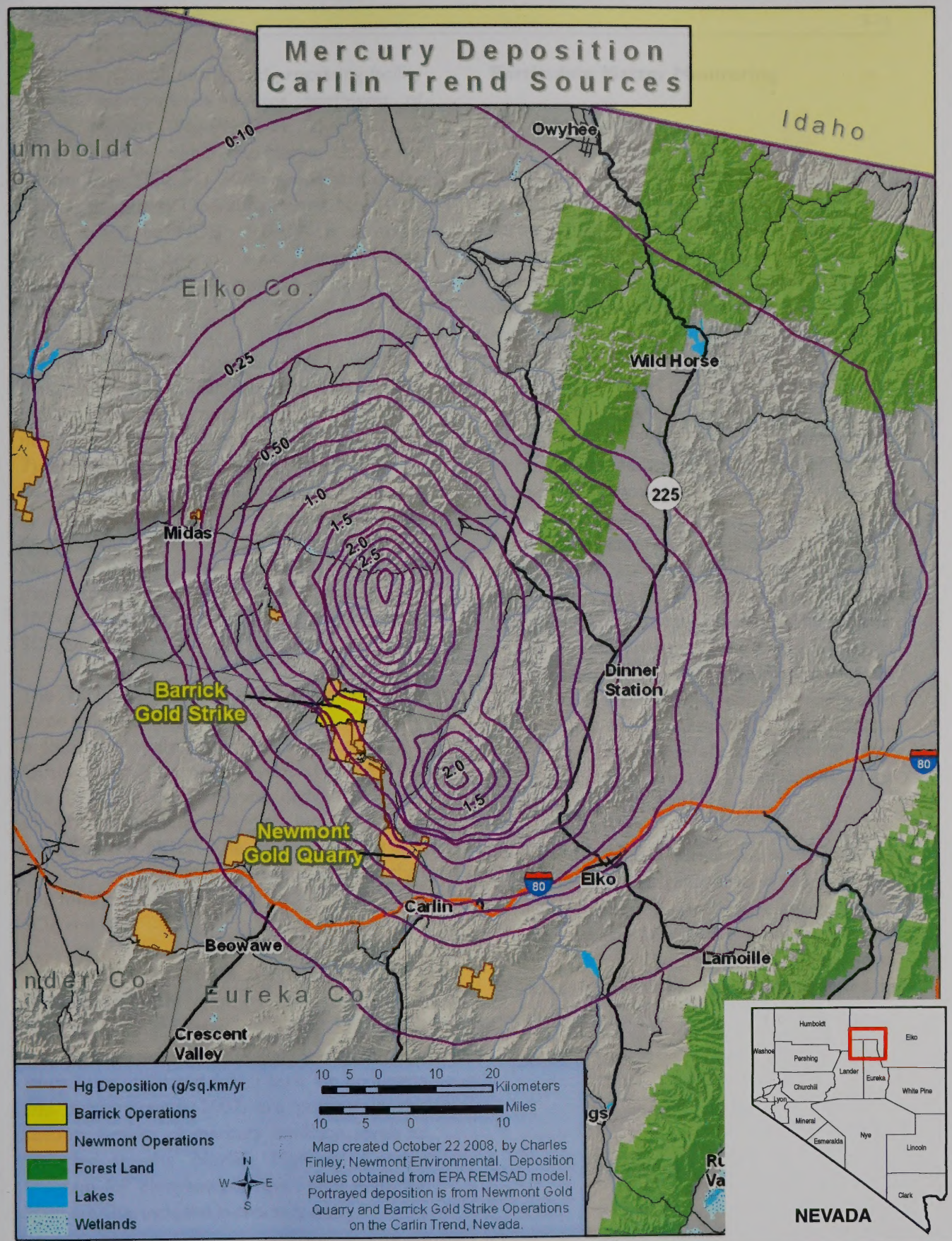


U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

AIR RESOURCES
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-1

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig_3-1_Air_Resources.mxd



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

MECURY DEPOSITION CARLIN TREND SOURCES
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-2

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS Figures\New Fig 3-2.mxd

SOAPA is a metal mining and processing facility located approximately 6 miles northwest of Carlin, Nevada (**Figure 2-7**). The mine is located entirely within the Maggie Creek Air Quality Basin (No. 51). SOAPA operates under Class I Air Quality Operating Permit No. 1041-0793, issued by NDEP. SOAPA is a major source (potential to emit greater than 100 tons/year) of fine particulate matter, NO_x, SO_2, and CO.

Barrick Goldstrike operates the Betze/Post Mine which is a metal mining and processing facility located approximately 25 miles north-northwest of Carlin, Nevada (**Figure 2-7**); entirely within the Boulder Flat Air Quality Basin (No. 61 - Upper) as shown on **Figure 3-1**. The Betze/Post Mine currently operates under Class I Air Quality Operating Permit No. 1041-0739.01. The Betze/Post Mine is a major source (potential to emit greater than 100 tons/year) of fine particulate matter, NO_x, SO_2, and CO.

The TS Power Plant is located approximately three miles north of Dunphy, Nevada. The plant is located entirely within the Boulder Flat Air Quality Basin (No. 61 - Lower) (**Figure 3-1**). The TS Power Plant operates under Class I Air Quality Operating Permit No. 4911-1349, issued by the NDEP. The TS Power Plant is a major source (potential to emit greater than 100 tons/year) of fine particulate matter, NO_x, SO_2, and CO

MONITORING DATA AND NEW INFORMATION

Air quality monitoring data, which include information collected for criteria air pollutants and mercury since 2002, are present in this section. Results of mercury emission levels as reported in the Nevada Mercury Control Program for companies in the Study Area for 2008 are also included in this section.

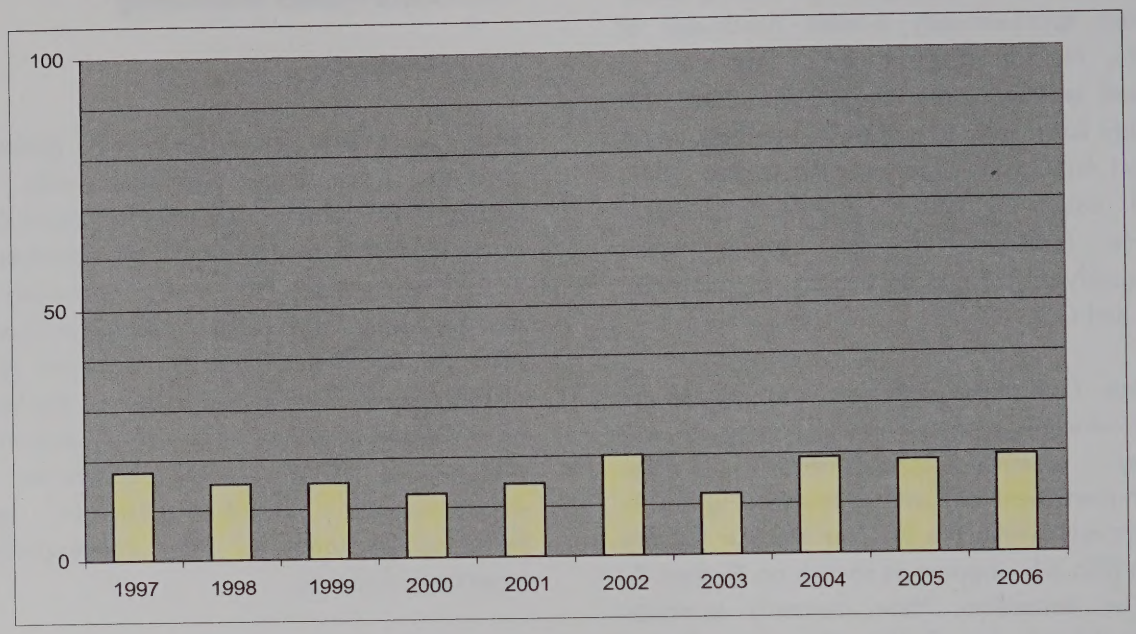
Particulate Matter Monitoring

PM_{10} Monitoring

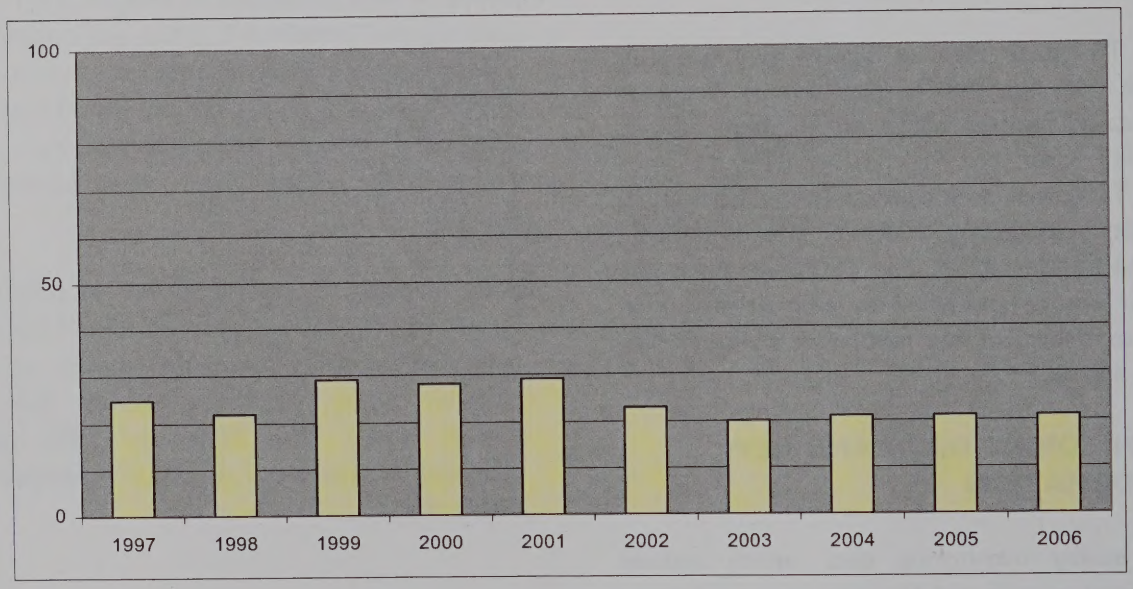
PM_{10} represents a criteria air pollutant consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). PM_{10} air quality monitoring data have been collected from the Gold Quarry mine site, within the Study Area, and the town of Elko, about 20 miles to the east of the Study Area. Data collected prior to and subsequent to startup of SOAPA were compared to determine if SOAPA operations have incrementally added to PM_{10} concentrations from other sources.

PM_{10} monitoring data were examined for 1997 through 2006 to evaluate potential cumulative air quality effects of Leeville and SOAPA operations since startup in 2002. The 10-year period of data presented in **Graph 3-1** (Gold Quarry) and **Graph 3-2** (Elko) represents the 5-year period before initiation of Leeville and SOAPA and the 5-year period after initiation. The term "mean" refers to calendar year average of the 24-hour PM_{10} concentrations for that year.

$PM_{2.5}$ air quality monitoring data were collected on six days in the summer of 1996 from the same Gold Quarry mine site location as the PM_{10} air quality monitoring stations (iml Air Science 1996). The PM_{10} and $PM_{2.5}$ data collected on the same days are presented in **Table 3-2**.



Graph 3-1. Gold Quarry - Mean PM_{10} Monitoring Data Summary ($\mu g/m^3$)



Graph 3-2. Elko - Mean PM_{10} Monitoring Data Summary ($\mu g/m^3$)

TABLE 3-2
South Operations Area (Gold Quarry) $PM_{2.5}/PM_{10}$ Monitoring Data

Sample Date	Filter $PM_{2.5}$ ($\mu g/m^3$)	Filter PM_{10} ($\mu g/m^3$)
26-Jul-96	11	27
01-Aug-96	10	32
07-Aug-96	11	30
13-Aug-96	36	83
19-Aug-96	15	32
25-Aug-96	16	28
Averages	**16**	**39**

Source: iml Air Science 1996.

$PM_{2.5}$ and PM_{10} ambient air concentration data have also been collected from two monitoring sites in northern Nevada that were part of the national Interagency Monitoring of Protected Visual Environments (IMPROVE) program (UC Davis 1995). The IMPROVE program stations were designed to collect data at national parks and wilderness areas to study and protect visibility in these areas Class I airsheds. These two northern Nevada IMPROVE $PM_{2.5}$ and PM_{10} monitoring sites were located outside the cumulative effects Study Area for air quality, but are the nearest source of long-term cumulative $PM_{2.5}$ and PM_{10} ambient air concentration monitoring data. The IMPROVE Jarbidge Wilderness site (JARB1), located approximately 85 miles north-northeast of the Gold Quarry $PM_{2.5}$ and PM_{10} monitoring stations, collected ambient air data from collocated $PM_{2.5}$ and PM_{10} monitoring stations from 1988 through 2004 (Colorado State University 2004). The IMPROVE Great Basin National Park site (GRBA1), located approximately 161 miles southeast of the Gold Quarry $PM_{2.5}$ and PM_{10} monitoring stations, collected ambient air data from collocated $PM_{2.5}$ and PM_{10} monitoring stations from 1992 through 2004. For the periods of record, the Jarbidge Wilderness and Great Basin National Park sites had average $PM_{2.5}$ concentrations of 2.62 and 2.68 micrograms per cubic meter ($\mu g/m^3$); and average PM_{10} concentrations of 6.54 and 5.97 $\mu g/m^3$.

Mercury

The Nevada Mercury Control Program (NMCP) is a State regulatory program that requires mercury emissions controls on thermal units located at precious metal mines. The NMCP was adopted March 8, 2006 and made effective May 4, 2006. The Program achieves mercury reduction via add-on control technologies. The NMCP requires all precious metal processing facilities with SIC codes "1041" or "1044" be reviewed for applicability under the NMCP. At this time, the NMCP regulations focus on the potential for mercury emissions from thermal processing units only.

The USEPA has not established a National Emission Standard for Hazardous Air Pollutants (NESHAPS) for mercury emissions from gold ore processing facilities. Mercury is not considered a primary pollutant, and no National Ambient Air Quality Standards (NAAQS) have been established under the Clean Air Act.

Mercury, a trace metal Hazardous Air Pollutant identified in the Clean Air Act, is often bound in gold ore and can be released into the atmosphere through a variety of thermal treatment processes involved with the refining of gold including autoclaves, carbon kilns, furnaces, retorts, and roasters. When bound in mineral forms that typically appear in ore (e.g., cinnabar), mercury is a stable compound that remains in solid form. Ore processing has

potential to liberate mercury from stable minerals by dissolving it in process solutions. Because it has a boiling point of 675°F, mercury has potential to volatilize into a gaseous form when subjected to thermal processes in a recovery and refining circuit.

Mercury content of ore mined at Barrick's Betze/Post Mine ranges from 1.0 ppm to 10 ppm (BLM 2008). Ore from Newmont operations has the following mercury content:

- Chukar 4.43 ppm;
- Gold Quarry 6.90 ppm;
- Genesis 4.80 ppm;
- Leeville 17.54 ppm; and
- Emigrant 4.00 ppm (Newmont 2008b).

The TS Power Plant emits approximately 0.02 pound of mercury per gigawatt hour (permit limit), on an annual basis. A 200 megawatt capacity for 8,760 hours/yr equates to 1,752 gigawatts emitting approximately 35 pounds of mercury annually. The TS Power Plant has installed activated carbon injection for mercury control, and recent performance tests showed emissions less than 35 pounds per year (AECOM Environment 2009).

In addition to manmade facilities such as mine and power plants that release mercury, Nevada has large areas of naturally occurring mercury. Natural sources include gases from volcanic areas and geothermal vents, as well as evaporation from naturally mineralized soil and wetlands. Global and local anthropogenic sources of mercury exist in the Study Area. Background levels vary from location to location and from one time period to another but generally fall in the range of 0.001 to 0.004 micrograms per cubic meter ($\mu g/m^3$) (Slemr and Langer 1992; Lin and Pehkonen 1999) in remote locations far from human sources.

Mercury occurs in the environment as gaseous elemental mercury, reactive gaseous mercury, or particulate mercury. Reactive gaseous mercury and particulate mercury account for less than 2 percent of the total concentration in air, with elemental mercury accounting for more than 98 percent of the total (Fitzgerald *et al.* 1991). The fate of mercury emissions follows a progression from the emission source to transport, deposition and potential exposure. A portion of emissions are deposited locally near the source while the remaining portion is dispersed regionally and globally.

Gaseous elemental mercury is a relatively non-reactive chemical form that is not very soluble in water. Gaseous mercury must be transformed to particulate (oxidized) mercury in order to contribute substantially to mercury deposition and subsequent entry into water bodies where further transformation to methylmercury (CH_3Hg^+) can make the mercury available in the aquatic food chain (Porcella 1994).

Average atmospheric residence time for particulate mercury ranges from hours to days (depending on the presence or absence of precipitation and the particle size). Particulate mercury has low volatility and is easily taken up in precipitation or adsorbed on small particles, falling out relatively close to the emission source in the presence of precipitation, or as dry deposition that may be transported longer distances if associated with smaller particle sizes. Particle-bound mercury is relatively stable and is not easily converted to methylmercury (EPA 1997).

Mercury deposition rate data have been collected from two wet-deposition monitoring sites in northern Nevada that are part of a national Mercury Deposition Network. These sites are outside the cumulative effects Study Area for mercury, but are the nearest source of cumulative mercury deposition monitoring data. The monitoring data presented here are from a wider geographic area than the Study Area, but

are believed representative of the trends in mercury deposition rates associated with atmospheric releases of mercury in northern Nevada. The Lesperance Ranch site (NV02) is located approximately 85 miles northwest of the Study Area, and the Gibbs Ranch site (NV99) is located approximately 73 miles northeast of the Study Area. Collection of mercury wet deposition data began at these sites in early 2003, and data are available through 2009.

Measured wet deposition for the Mercury Deposition Network site Lesperance Ranch (NV02) in northeast Nevada decreased from an annual average of 173 nanograms per square meter (ng/m^2) in 2003 to 84 ng/m^2 by 2008. Deposition rates at the site ranged from 3 to 1,954 ng/m^2 during the period. At the Gibb's Ranch monitoring site (NV99), annual mercury wet deposition decreased from 188 ng/m^2 in 2003 to 116 ng/m^2 in 2008. Deposition rates at the site ranged from 1 to 850 ng/m^2 during the period (NADP 2010). Data for 2009 was incomplete at the time this document was prepared.

CUMULATIVE EFFECTS

Air Quality Modeling – Particulate Matter, NO_2, SO_2, and CO

Gaseous criteria air pollutant emissions such as SO_2, NO_2, and CO typically result from combustion related activities. For most mining projects, the major air quality issues are emissions of particulate pollutants, not gaseous pollutants. Ambient monitoring of gaseous emissions at the SOAPA and Betze/Post mine projects is not required under the air quality permits. There are no other stations operated in northeastern Nevada to monitor gaseous ambient air pollutant concentrations. Accordingly, no measured data are available to characterize existing air quality for these gaseous air pollutants. The air quality modeling analysis discussed below addresses particulate and gaseous emissions at these facilities.

An air quality modeling analysis was conducted by Environmental Management Associates (EMA 2007a) for this cumulative effects analysis. EMA prepared a modeling protocol (July 2, 2007), which was submitted to and reviewed by BLM and others. The study was prepared in conformance with the protocol.

The EPA-approved AMS/EPA Regulatory Model (AERMOD) (Version 07026) was used to conduct the air quality analysis. Trinity Consultants' BREEZE AERMOD GIS Pro v6.1.6 modeling manager was used to prepare the input files and manage AERMOD processing. The model was run using elevated terrain, PRIME building downwash algorithms, and EPA regulatory defaults. **Table 3-3** summarizes emission sources considered in the cumulative air quality modeling analysis (EMA 2007a).

A total of 338 sources of emission were included in the modeling covering all emission sources in the five facility groups noted in **Table 3-3**. Emissions were organized into a series of emission source groups so that different combinations of source impacts could be evaluated separately (EMA 2007a). Consistent with direction from NDEP Bureau of Air Pollution Control for regulatory modeling, a background 24-hour PM_{10} concentration of 10.2 µg/m^3, and a an annual PM_{10} concentration of 9.0 µg/m^3, were added to the maximum modeled 24-hour concentration and the maximum modeled annual concentration, respectively, to account for background PM_{10} concentrations and determine compliance with applicable Nevada Ambient Air Quality Standards.

Modeling incorporated 12 months of meteorological data (09/01/03 – 08/31/04) collected by Newmont Nevada Energy Investment, LLC from its TS Power Plant site, processed using AERMET Version 06341 using the corresponding 12 months of upper air data (09/01/03 – 08/31/04) from Elko. Processing

these meteorological data was previously accepted by NDEP and, therefore, its use is justified for facility emission sources to be modeled based on proximity of the emission sources and the generally similar albedo, mid-day Bowen ratio, and surface roughness length of the locations (all are considered desert shrubland).

TABLE 3-3
Summary of Emission Sources Included in Air Quality Modeling

Facility	Number of Model Sources	Emissions of PM_{10} (tons/year)	Emissions of CO (tons/year)	Emissions of NO_x (tons/year)	Emissions of SO_2 (tons/year)
SOAPA	84	568	337	354	276
Leeville	7	0.5	0	0	0
North Operations Area without Leeville	40	93.8	0	0	0
Betze/Post	179	579	400	311	996
TS Power Plant	28	598	744	1,170	1,546
TOTAL	**338**	**1,840**	**1,480**	**1,835**	**2,818**

Note: CO = carbon monoxide; NO_x = nitrogen oxides; SO_2 = sulfur dioxide.
Source: EMA 2007a.

Modeling of criteria air pollutants was conducted to determine the first high ambient air concentration for the regulatory time periods presented in **Table 3-4**. Calculation of the first high concentration also ensures compliance with applicable National Ambient Air Quality Standards for the same averaging periods.

TABLE 3-4
Modeled Air Pollutants and Applicable Time Periods for Nevada First-High Standards

Criteria Pollutant	Averaging Period	Applicable Standard ($\mu g/m^3$)
Particulate Matter - 10 Microns in Aerodynamic Diameter (PM_{10})	24-Hour	150
	Annual	50
Sulfur Dioxide (SO_2)	3-Hour	1,300
	24-Hour	365
	Annual	80
Nitrogen Oxides (NO_x)	Annual	100
Carbon Monoxide (CO)	1-Hour	40,000
	8-Hour	10,000

Note: $\mu g/m^3$ = micrograms per cubic meter
Source: EMA 2007a.

Modeling was conducted for oxides of nitrogen (NO_x), rather than nitrogen dioxide (NO_2), the pollutant for which ambient standards have actually been adopted. In general, emissions of NO_X, which consists of both NO_2 and other oxides of nitrogen, provide an accurate estimate of NO_2 emissions for each of the projects modeled in this assessment for the NDEP regulatory process. Since an assessment using NO_x is consistent with the EPA's Guideline on

Air Quality Models (Appendix W to 40 CFR PART 51), and results in a conservative assessment which would over-predict the anticipated ambient concentrations of NO_2 resulting from the sources modeled, NO_X emissions are usually calculated.

Receptors are the locations at which the model was directed to calculate concentrations. Modeling was conducted using Cartesian grid receptors, spaced at 1,000-meter intervals from the boundary of each facility which prevents or deters access by the public to the outer boundary of the three air quality basins (No. 51, No. 52 or No. 61 (Upper and Lower)). In addition, receptors were selected to address impacts in Class I areas. The closest Class I airshed to the Study Area is the Jarbidge Wilderness, the southwest corner of which is located approximately 109 and 104 km northeast of the closest SOAPA and Leeville Mine emission sources, respectively. To evaluate potential cumulative air quality impacts to this Class I airshed, model receptors were located 50 km from the Leeville Mine and SOAPA sources closest to the southwest corner of the Jarbidge Wilderness Class I airshed on a line from each source to this corner of the Class I airshed. Although located less than half the distance to the Class I airshed, placement of these receptors at 50 km from these sources is consistent with EPA's Guideline on Air Quality Models (Appendix W to 40 CFR PART 51). EPA's position is that 50 km is the nominal distance appropriate for Gaussian models such as AERMOD. Modeling results confirm no impact to the Class I airshed.

Table 3-5 shows the maximum first high ambient air pollutant concentrations of PM_{10}, SO_2, NO_x, and CO modeled from all modeled sources are below the applicable ambient air quality standard, even with the addition of the applicable background concentration. **Table 3-5** also shows that the maximum first high ambient air pollutant concentrations modeled at the Cartesian grid receptors from the SOAPA emission sources alone are nearly equal to the maximum cumulative modeled concentrations.

Although neither the SOAPA Mine nor the Leeville Mine are subject to the federal Prevention of Significant Deterioration regulations (40 CFR 52.21), ambient air pollutant concentrations modeled at the two receptors used to estimate potential impacts to the Class I airshed can be compared to Class I increments under the Prevention of Significant Deterioration regulations. As shown in **Table 3-6**, the maximum first high ambient air pollutant concentrations modeled from all modeled sources at the two receptors are below ten percent of the Class I Prevention of Significant Deterioration increments (EMA 2007a).

Potential cumulative $PM_{2.5}$ concentrations were evaluated using the PM_{10} modeling concentrations reported in the 2007 cumulative modeling report. The first high cumulative annual PM_{10} concentration from all modeled sources was 4.97 $\mu g/m^3$ (without any background concentration; 13.97 $\mu g/m^3$ with the NDEP background concentration of 9.0 $\mu g/m^3$). Since both of these PM_{10} concentrations are below the annual $PM_{2.5}$ NAAQS (the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 $\mu g/m^3$), $PM_{2.5}$ concentrations would not exceed the annual $PM_{2.5}$ NAAQS.

TABLE 3-5
Results of Modeling for the Cartesian Grid Receptors

Criteria Pollutant	Averaging Period	First High Concentration ($\mu g/m^3$)				Total % of Ambient Standard	First High Concentration ($\mu g/m^3$)		
		Ambient Standard	Maximum Cumulative High	Background	Total		Maximum Cumulative High	Maximum SOAPA High	Maximum Incremental Increase
Particulate Matter <10 Microns in Aerodynamic Diameter (PM_{10})	24-hour	150	47.99	10.20	58.19	38.79%	47.99	47.74	0.2
	Annual	50	4.97	9.00	13.97	27.94%	4.97	4.73	0.24
Sulfur Dioxide (SO_2)	3-hour	1,300	37.45	0.00	37.45	2.88%	37.45	37.35	0.10
	24-hour	365	8.45	0.00	8.45	2.31%	8.45	8.07	0.38
	Annual	80	1.02	0.00	1.02	1.28%	1.02	0.90	0.12
Nitrogen Dioxide (NO_2)	Annual	100	1.09	0.00	1.09	1.09%	1.09	0.94	0.16
Carbon Monoxide (CO)	1-hour	40,000	218.21	0.00	218.21	0.55%	218.21	96.57	121.64
	8-hour	10,000	38.43	0.00	38.43	0.38%	38.43	17.14	21.30

$\mu g/m^3$ = micrograms per cubic meter.

TABLE 3-6
Results of Class I Airshed Increment Modeling

Criteria Pollutant	Averaging Period	First High Concentration ($\mu g/m^3$)		Percent of Class I Increment	First High Concentration ($\mu g/m^3$)		
		Class I PSD	Maximum Cumulative High		Maximum Cumulative High	Maximum SOAPA High	Maximum Incremental Increase
Particulate Matter <10 Microns in Aerodynamic Diameter (PM_{10})	24-hour	8	0.5096	6.37%	0.5096	0.3056	0.2040
	Annual	4	0.0863	2.16%	0.0863	0.0307	0.0556
Sulfur Dioxide (SO_2)	3-hour	25	1.4386	5.75%	1.4386	0.6678	0.7708
	24-hour	5	0.4159	8.32%	0.4159	0.2160	0.1999
	Annual						
Nitrogen Dioxide (NO_2)	Annual	3	0.0593	2.37%	0.0593	0.0216	0.0377

$\mu g/m^3$ = micrograms per cubic meter; PSD = Prevention of Significant Deterioration. Source: EMA 2007a.

The first high cumulative PM_{10} 24-hour concentration from all modeled sources was 47.99 µg/m³ (without any background concentration, 58.19 µg/m³ with the background concentration of 10.2 µg/m³), located at a point immediately north of the Gold Quarry project boundary. Although this was greater than the $PM_{2.5}$ 24-hour NAAQS of 35 µg/m³, $PM_{2.5}$ emissions from these projects would be substantially lower than the modeled PM_{10} emissions. The current EPA emission estimating guidance for metallic minerals processing (AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Volume I, Chapter 11: Mineral Products Industry, Section 11.24 Metallic Minerals Processing [08/82]) contains no estimating factors for fine particle ($PM_{2.5}$) emissions from metallic mineral mining. However, emission review documents have suggested $PM_{2.5}/PM_{10}$ ratios for fugitive dust emissions from mining operations of from 0.10 to 0.15 (WRAP 2007; MRI 2006). The ambient air $PM_{2.5}$ and PM_{10} concentrations monitored on the Gold Quarry mine site, which were collected during ongoing mining operations, would suggest a higher $PM_{2.5}/PM_{10}$ emission ratio of 0.428 for all sources.

Using this range of $PM_{2.5}/PM_{10}$ emission ratios from the emission review studies and the Gold Quarry monitoring site (0.10 to 0.428), the first high cumulative 24-hour $PM_{2.5}$ concentration calculated from the modeled first high PM_{10} concentration from all modeled sources would be 4.80 to 20.54 µg/m³ (without any background concentration), By adding the average $PM_{2.5}$ concentration of 2.68 µg/m³ measured by the IMPROVE Great Basin National Park station as a background concentration, the calculated cumulative 24-hour $PM_{2.5}$ concentration would range from 7.48 to 23.22 µg/m³.

Note that these first-high $PM_{2.5}$ concentrations are conservative values to compare to the $PM_{2.5}$ 24-hour NAAQS, which for attainment requires only that the 3-year average of the 98th percentile of the 24-hour the $PM_{2.5}$ concentrations at each population-oriented monitor within an area, not exceed 35 µg/m³.

In addition to EMA's air quality dispersion modeling analyses of the Study Area, other air quality dispersion modeling studies of the region confirm that air quality impacts from these facilities tend to be confined to the facility area, with little potential for overlap or cumulative impact as discussed below. Reported concentrations in the following site-specific modeling analyses are conducted with the receptor placed at the fence line as per NDEP requirements for permitting. In the preceding discussion, receptors were placed outside of the project boundaries to simulate cumulative effects.

South Operations Area Modeling

The South Operations Area dispersion modeling analysis predicted maximum cumulative annual PM_{10} impacts of 15.03 µg/m³ and maximum 24-hour PM_{10} impacts of 76.67 µg/m³ (without any background concentrations, 24.03 µg/m³ and 86.87 µg/m³ with the NDEP background concentrations of 9.0 and 10.2 µg/m³, respectively). Predicted PM_{10} impacts (including background concentrations) represent 48 percent of the annual Nevada PM_{10} ambient air quality standard of 50 µg/m³ and 58 percent of the 24-hour PM_{10} ambient air quality standard of 150 µg/m³. Applying the ambient air quality standards as criteria, predicted air quality impacts from the South Operations Area dispersion modeling demonstrates that cumulative PM_{10} air impact issues would be below all applicable criteria in the air quality Study Area (air basins). Based on these results, NDEP concluded that SOAPA would comply with the PM_{10} ambient air quality standard and could be permitted and operated as proposed.

Using the same range of $PM_{2.5}/PM_{10}$ emission ratios from the emission review studies and the Gold Quarry monitoring site (0.10 to 0.428), the South Operations Area dispersion modeling analysis would have predicted a maximum annual $PM_{2.5}$ concentration of from 1.50 to 6.43 µg/m³ (4.18 to 9.11 µg/m³ when including the annual average $PM_{2.5}$ concentration measured at the Great Basin National Park station as a background concentration), Applying the calculated ratio of the average 98th percentile and first high 24-hour PM_{10} concentrations collected on site from the Gold Quarry PM_{10} monitoring stations (0.84) and the $PM_{2.5}/PM_{10}$ emission ratios (0.10 to 0.428) to the modeled South Operations Area 24-hour PM_{10} concentrations, the 98th percentile of the 24-hour $PM_{2.5}$ concentration at the modeled point of the highest concentration would range from 6.44 to 27.24 µg/m³ (without the background concentration – 9.12 to 29.92 µg/m³ with the addition of the Great Basin National Park background concentration). These values are below the $PM_{2.5}$ 24-hour NAAQS concentration of 35 µg/m³ for the 98th percentile concentration.

The air quality dispersion modeling study for the South Operations Area included predicted impacts of gaseous criteria air pollutants SO_2, NO_2, and CO. This modeling was completed in 2006 (EMA 2006). The SOAPA dispersion modeling analysis predicted the following maximum cumulative effects:

3-hour SO_2: 122.09 µg/m³
(ambient air quality standard = 1,300 µg/m³)

24-hour SO_2: 29.58 µg/m³
(ambient air quality standard = 365 µg/m³)

Annual SO_2: 2.95 µg/m³
(ambient air quality standard = 80 µg/m³)

Annual NO_2: 3.50 µg/m³
(ambient air quality standard = 100 µg/m³)

1-hour CO: 101.08 µg/m³
(ambient air quality standard = 40,000 µg/m³)

8-hour CO: 25.21 µg/m³
(ambient air quality standard = 10,000 µg/m³)

Predicted air quality impacts range from 0.3 percent of the CO ambient air quality standard to 9 percent of the 3-hour SO_2 ambient air quality standard. Background concentrations were not added to these impacts in the analysis, in part because the impacts were low and the lack of gaseous air pollutant monitoring data. By applying the ambient air quality standard as significance criteria, it is reasonable to conclude that the predicted SO_2, NO_2, and CO air quality impacts from the South Operations Area dispersion modeling demonstrate no significant effects issues in the Study Area (**Figure 3-1**). Based on this analysis, NDEP concluded that SOAPA would comply with the SO_2, NO_2, and CO ambient air quality standard and could be permitted and operated as proposed.

TS Power Plant Modeling

The TS Power Plant is a new 200-MW coal-fired electrical generating facility located in Lower Basin 61, approximately 18 miles west of the Leeville and SOAPA facilities. The TS Power Plant operates under Class I Air Quality Operating Permit No. 4911-1349, issued by NDEP – Bureau of Air Pollution Control.

The TS Power Plant air quality dispersion modeling analysis examined the potential impact of PM_{10} as well as SO_2, NO_2, and CO in Lower Basin 61, where the facility is located, as well as the impacts from the facility in nearby Upper Basin 61(where the Leeville Project is located), Basin 51(where South Operations Area is located), and Basin 62. Predicted potential PM_{10} air quality impacts from the TS Power Plant indicate no exceedance above air permitting Significant Impact Levels in any of the four air

basins, eliminating the need for further cumulative analysis in the NDEP air permitting process. Prediction of maximum impacts below the Significant Impact Levels supports the conclusion that there would be no cumulative effect of consequence between the TS Power Plant and other sources in the Carlin Trend. The maximum predicted 24-hour PM_{10} impact from the TS Power Plant facility is 3.86 $\mu g/m^3$ and the maximum predicted annual PM_{10} impact is 0.48 $\mu g/m^3$. Even without the application of any $PM_{2.5}/PM_{10}$ ratios, and with the addition of the 2.68 $\mu g/m^3$ background $PM_{2.5}$ concentrations, these PM_{10} concentrations are below the 24-hour and annual $PM_{2.5}$ NAAQS. The expected contribution from the TS Power Plant in the Carlin Trend would be lower than these values given the additional dispersion that would occur over the distance to other sources. Predicted air quality impacts from the TS Power Plant dispersion modeling demonstrates cumulative PM_{10} air effects would be below ambient standards in the air quality Study Area (**Figure 3-1**).

Predicted potential SO_2, NO_2, and CO emissions from the TS Power Plant were below the air permitting Significant Impact Levels in each of the four air basins. Maximum predicted effects from the TS Power Plant for SO_2, NO_2, and CO are presented below:

3-hour SO_2: 24.69 $\mu g/m^3$
(SIL = 25 $\mu g/m^3$)

24-hour SO_2: 4.88 $\mu g/m^3$
(SIL = 5 $\mu g/m^3$)

Annual SO_2: 0.46 $\mu g/m^3$
(SIL = 1 $\mu g/m^3$)

Annual NO_2: 0.56 $\mu g/m^3$
(SIL = 1 $\mu g/m^3$)

1-hour CO: 181.07 $\mu g/m^3$
(SIL = 2,000 $\mu g/m^3$)

8-hour CO: 25.10 $\mu g/m^3$
(SIL = 500 $\mu g/m^3$)

Criteria Air Pollutant Impact Conclusions

PM_{10} monitoring data collected at SOAPA and Elko do not reflect a discernable increase in PM_{10} concentrations from before Leeville and SOAPA began operation in 2002 through 2006 (see Graph 3-1 and Graph 3-2); concentrations remain within the ambient air quality standard of 50 micrograms per cubic meter ($\mu g/m^3$) on an annual basis and 150 $\mu g/m^3$ on a 24-hour basis. The lack of increase in PM_{10} concentrations indicate that neither Leeville nor SOAPA operations are resulting in cumulative air quality impacts since operations began. No violations of air quality permits have been issued by NDEP to date for any mine activities in the Study Area.

The PM_{10}, SO_2, NO_2, and CO modeling predictions and monitoring data presented in this section underscore the lack of cumulative air quality impacts in the Study Area. While changes in permitted criteria air pollutant emissions are expected in the Study Area and outside the region, known projects are not located in close proximity to Leeville, SOAPA, and other sources in the Study Area. Consequently cumulative impacts involving reasonably foreseeable projects would not result in exceedance of ambient air quality standards. Safeguards included in the NDEP permitting process would restrict air emissions such that cumulative effects to air quality from multiple sources would not violate ambient air quality standards.

Ruby Pipeline Project

Construction of the Ruby Pipeline Project would involve use of heavy equipment that would produce dust from soil disruption and air contaminants from combustion emissions. The Project would comply with state and local requirements and implement Best Management Practices for dust control.

The Wieland Flat Compressor Station would be constructed about 35 miles north of Elko. Emissions from the compressor station would be required to meet federal and state regulatory standards. Operational emissions would result from combustion associated with gas-fired turbines, emergency generators, and auxiliary heaters at the compressor station. Greenhouse gases (CO_2, CH_4, and N_2O) would be produced from combustion sources. Based on dispersion modeling analyses completed for the compressor station operation of the pipeline system would not cause nor contribute to an exceedance of ambient air quality standards (FERC 2009).

Mercury

Mercury deposition data for the Carlin Trend and State of Nevada were compiled using data from the EPA Regional Modeling System for Aerosols and Deposition (REMSAD) model. Results of REMSAD modeling are used to quantify contributions of specific sources and source categories of mercury deposition within the lower 48 states (EPA 2006). The REMSAD Model computes site-specific output of mercury deposition in grams per square kilometer per year ($g/km^2/yr$) based on a variety of parameters.

The output is in digital grid format encompassing EPA Region 9 as a set of 144 km^2 cells (n=347,606), each with a cell ID and total deposition value. The data is delivered in a geodatabase format specific to geospatial data and related tabular attributes. The geodatabase includes the total contribution for each cell from each source site within the Region (a total of 298 sources).

Regional Mercury Deposition

A recent modeling effort conducted by ICF International for EPA compiled mercury emissions for the contiguous 48 States, Southern Canada, and Northern Mexico, and evaluated deposition rates of airborne mercury from both domestic and international sources (ICF 2008). The ICF study concluded, consistent with modeling results for other pollutants, the dominant influence on air quality for mercury is generally the source closest to the receptor. Overlapping or cumulative effects were not substantial at peak deposition locations and mercury levels across state boundaries are low. For example, model-predicted deposition rates at the peak location in Utah showed that mercury contribution at that point was caused predominantly by sources in Utah (74.7 percent) and secondarily by source from outside the US (21.9 percent). Neighboring states, including Nevada, accounted for approximately 0.2 percent of mercury deposition at the peak location in Utah.

Of the states bordering Nevada (*i.e.*, California, Arizona, Oregon, Utah, and Idaho), all had peak mercury deposition rates higher than Nevada; Oregon had slightly lower deposition rates. With the exception of Arizona, the contribution of mercury from neighboring states was less than 1 percent of the total at the peak deposition location (ICF 2008). Annual mercury emissions from Nevada and the surrounding five states are summarized in **Table 3-7.**

TABLE 3-7
Annual Mercury Emissions by State

State	Total Mercury (tons/year)[1]
Arizona	1.043
California	6.095
Oregon	1.812
Nevada	3.082
Idaho	0.835
Utah	0.772
Total	**13.639**

[1] Includes elemental, divalent gas, and divalent particulate species.
Source: ICF 2008.

Scientists are beginning to collect and analyze mercury air emission, dispersion, and deposition data. Annual emission measurements required by NDEP under the Nevada Mercury Control Program will contribute to understanding mercury in the environment. In addition to emissions measurements, the Nevada Mercury Control Program relies on using and maintaining mercury controls which are subject to a Maximum Achievable Control Technology determination, as well as testing, sampling, operation, maintenance, monitoring, recordkeeping, and reporting to meet permit requirements.

The largest source of atmospheric mercury in Nevada is caused from processing gold through precious metal mines operations. In 2008, annual mercury emissions from Barrick's Betze-Post and Newmont's Gold Quarry operations totaled 588 pounds per year (lbs/yr) (0.3 ton) as reported to the Nevada Bureau of Air Pollution Control (NDEP 2009a). This represents 19 percent of total annual mercury emissions (3,165 lbs) from precious metal processing sources in Nevada.

Carlin Trend Mining Operations – Mercury Deposition

Figure 3-2 portrays the cumulative deposition values for mercury from Newmont's Gold Quarry Mill 5/6 and Barrick's Betze/Post facility. The deposition values are represented in concentric circles, with the lowest value portrayed as 0.10 g/km^2/yr, and increasing in increments of 0.25 g/km^2/yr to the highest predicted total deposition value from the specified source.

Because output data from the model is a grid of square cells (not conducive to accurate distribution mapping), predictions were created using Kriging. Kriging is a geostatistical method of predicting values at unmeasured locations based on weights of values at measured locations (in this case, the center of each grid square). Deposition contours were created based on the kriged dataset. The kriged dataset was contoured to display the extent of measurable deposition from the specified sources, as determined by the EPA REMSAD model.

Figure 3-2 displays two centers of deposition, approximately 20 km northeast of Barrick's Betze/Post facility, and about 15 km northeast of Newmont's Gold Quarry operation. The highest predicted value of deposition shown is 3.00 g/km^2/yr. The lowest displayed value of 0.10 g/km^2/yr is projected approximately 30 km southwest and 100 km to the northeast.

The percentage of total mercury deposition contributed by the global pool of mercury emissions to Nevada hydrographic basins is

shown on **Figure 3-3**. The lowest percentages of contribution by the global pool of mercury are located in northern Nevada. The lowest percentage of global pool contributions is located in Skedaddle Creek Valley, on the western border of Nevada.

Contributions to the global pool of mercury emissions to Nevada hydrographic basins from the two facilities on the Carlin Trend (Newmont's Gold Quarry Mill 5/6 and Barrick's Betze/Post) are shown on **Figure 3-4**. The highest percentage of contributions from Carlin Trend facilities (8.91 percent) is in Maggie Creek basin, located just east of the Newmont and Barrick facilities.

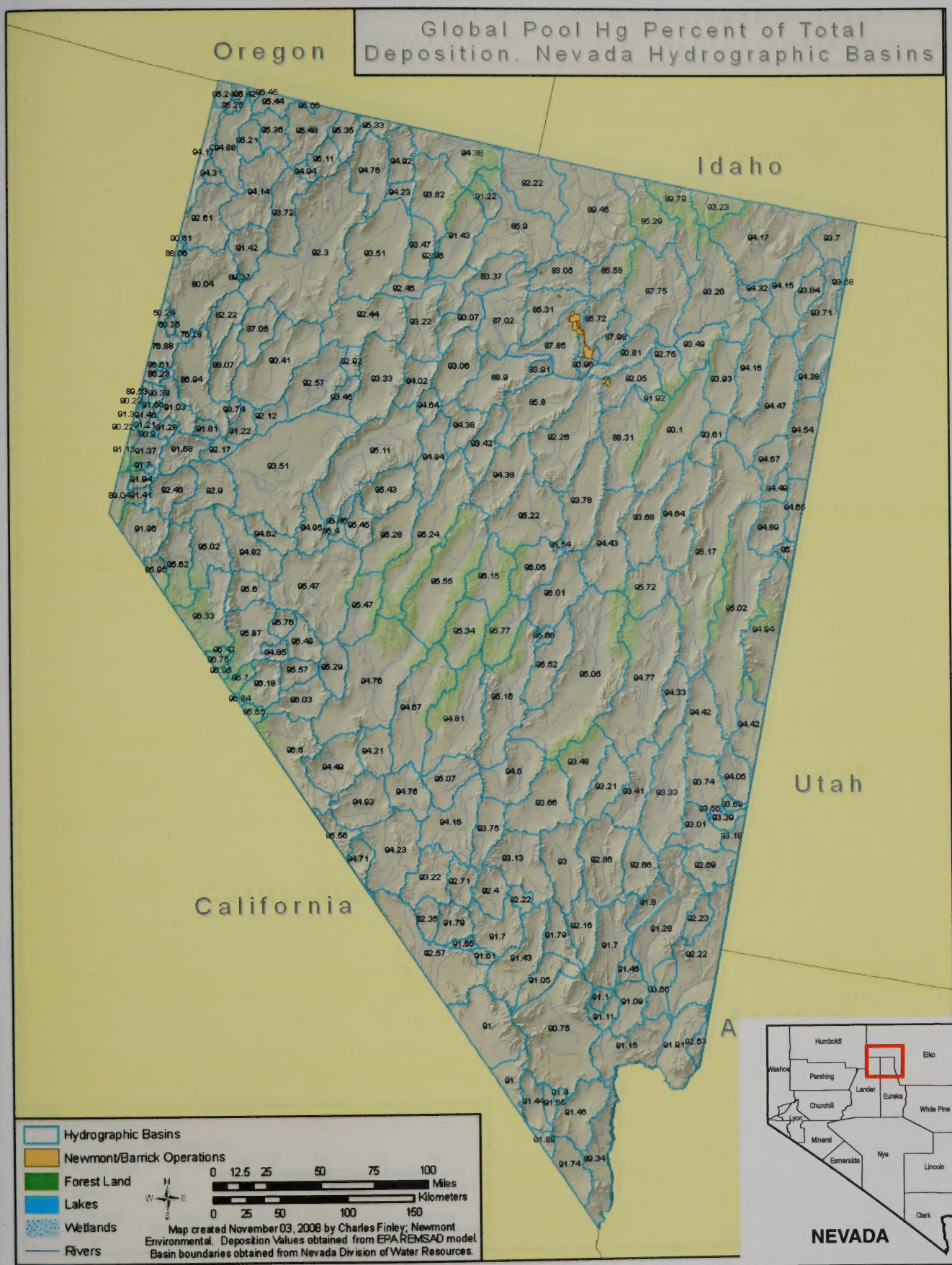
No mercury concentrations exceeding water quality standards have been detected in area streams monitored by mining operations in the Carlin Trend (see *Water Quality and Quantity* section in this chapter).

Climate Change

On-going scientific research has identified the potential impacts of "greenhouse gas" (GHG) emissions (including carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); water vapor; and several trace gasses) on global climate. Through complex interactions on a regional and global scale, these GHG emissions cause a net warming effect of the atmosphere (making surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to increase, and are likely to contribute to overall climatic changes, typically referred to as global warming. Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.

Depending on where measurements are reported, some scientists believe global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2007). The Intergovernmental Panel on Climate Change (IPCC 2007) and National Academy of Sciences (2006) indicated that by the year 2100, global average surface temperatures could increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels, but also indicated that there are uncertainties in the modeled results; especially regarding how climate change may affect different regions. Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24° N) have exhibited temperature increases of 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Without additional meteorological monitoring systems, it is not possible to determine the spatial and temporal variability and change of climatic conditions.

Mining operations in the Carlin Trend involve combustion of coal, diesel, propane, and gasoline, all of which contribute CO_2 to the atmosphere. In Nevada, the total CO_2 emissions from all combustion sources are approximately 56.3 million metric tons. Electrical power generation and transportation account for 78 percent of statewide emissions of CO_2 (NDEP 2008). The TS Power Plant emits about 1.4 million metric tons of CO_2 annually. Mining in the Carlin Trend represents about 3.5 percent (2.0 million metric tons CO_2 per year) of total CO_2 emissions from all sources within Nevada (NDEP 2008). Carbon dioxide is not regulated under any state or federal laws or regulations and no air quality standard has been developed for this component of atmospheric gas.

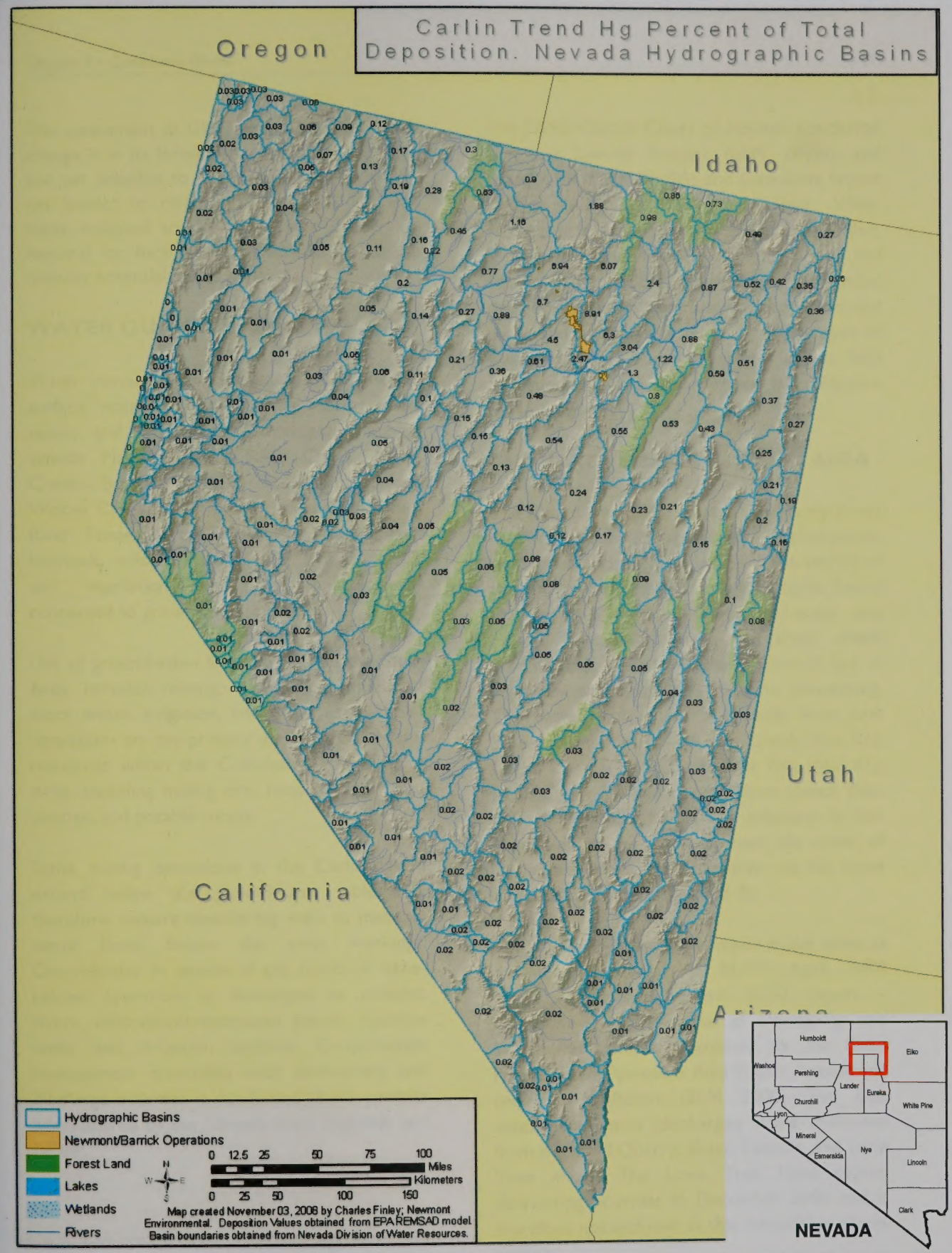


U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

GLOBAL POOL Hg PERCENT OF TOTAL DEPOSITION
NEVADA HYDROGRAPHIC BASINS
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-3

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\New_Fig_3-3.mxd



h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS Figures\New Fig 3-4.mxd

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

CARLIN TREND Hg PERCENT OF TOTAL DEPOSITION
NEVADA HYDROGRAPHIC BASINS
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

3-4

The assessment of GHG emissions and climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate. The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts.

WATER QUANTITY AND QUALITY

Water resources in the Study Area include surface water (streams, rivers, springs, and seeps) and groundwater. Principal drainages include Maggie Creek, Susie Creek, Marys Creek, Boulder Creek, Rock Creek, and Willow Creek – all tributary to the Humboldt River. These sources of surface water support livestock, wildlife, fish, aquatic animals, birds, and vegetation, and are hydrologically connected to groundwater systems.

Use of groundwater from aquifers in the Study Area includes mining, dewatering, municipal, stock water, irrigation, and other uses. Mining operations are the primary user of groundwater resources within the Cumulative Effects Study Area, including milling ore, heap leaching, dust control, and potable supply.

Some mining operations in the Carlin Trend extend below the groundwater table and, therefore, require dewatering wells to maintain water levels below the mine workings. Groundwater in excess of the needs of mine-related operations is discharged to streams, rivers, infiltration/evaporation ponds, injection wells, and irrigation systems. Groundwater management associated with dewatering and discharge activities is conducted under permits administered by the Nevada State Engineer and NDEP.

The Ninth Circuit Court of Appeals concluded that the Leeville Project (BLM 2002a) and SOAPA (BLM 2002b) EISs and *Cumulative Impact Analysis (CIA) of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project* (BLM 2000) report provided detailed analyses of cumulative effects associated with mine groundwater pumping. The analysis of water-related cumulative impacts in this Final SEIS tiers to and incorporates by reference those analyses.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for water quantity and quality encompasses surface water and groundwater in the vicinity of the Carlin Trend, including hydrographic basins that contain mine development areas and receive dewatering water, and areas where groundwater drawdown has occurred and is predicted to expand due to mine dewatering. The basins included in the Study Area are: Susie Creek (No. 50), Maggie Creek (No. 51), Marys Creek (No. 52), Boulder Flat (No. 61), Rock Creek (No. 62), and Willow Creek (No. 63). All of these basins are tributary to the Humboldt River, beginning near the town of Carlin, and extending down-river to the town of Battle Mountain (**Figure 3-5**).

The Study Area for this analysis is the same as the area evaluated in BLM's April 2000 cumulative impact analysis (CIA) report – *Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project* (BLM 2000). For that assessment, mine discharges were evaluated from the Gold Quarry, Betze, Leeville, and Lone Tree mines. The Lone Tree Mine ceased dewatering activities in December 2006 and is therefore not included in this cumulative effects analysis.

MONITORING DATA AND NEW INFORMATION

Water resources within the cumulative analysis area are monitored by several entities for a variety of purposes. Although most sites are established to monitor impacts from mining, impacts from livestock grazing, wildfires, industrial developments, and agricultural activities are also reflected in the data. Descriptions of the water monitoring sites and activities north of and including the Humboldt River are included in the Leeville Project EIS (BLM 2002a), SOAPA EIS (BLM 2002b), Betze Project Supplemental EIS (BLM 2003), and CIA report (BLM 2000).

The following primary water monitoring plans or programs incorporate monitoring activities for surface water and groundwater in the Carlin Trend area:

- Maggie Creek Basin Monitoring Plan (MCBMP): Since 1989, Newmont has been conducting monthly monitoring of surface water and groundwater in the Maggie Creek Basin related to mining and dewatering at Gold Quarry. The MCBMP, first submitted in 1991, includes measurement of surface water flow, depth to groundwater, and quality characteristics for surface water stations, wells, piezometers, and springs in the Maggie Creek, Marys Creek, Susie Creek, and the southeast portion of Boulder Flat hydrographic basins (Newmont 1992, 2009b).

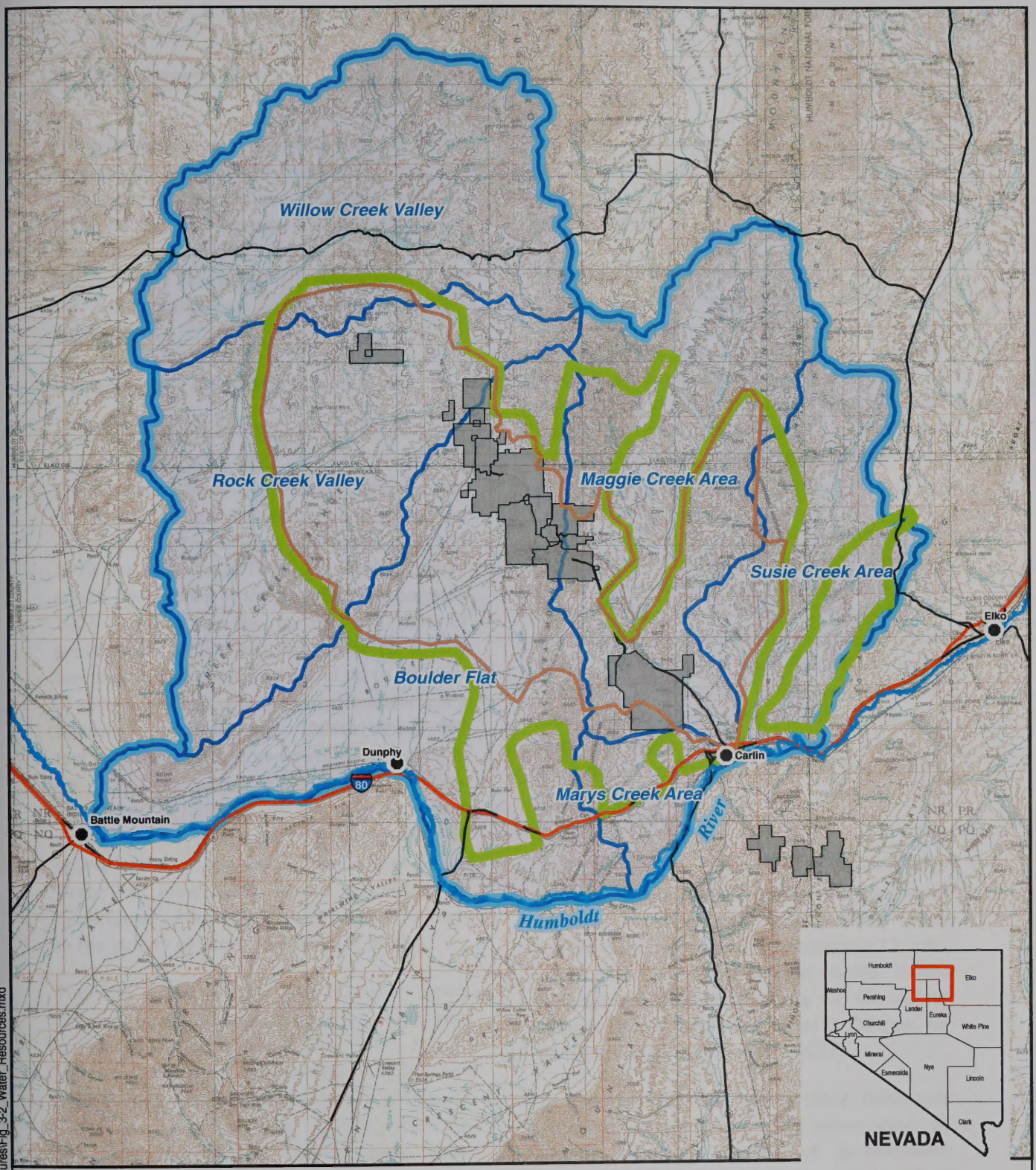
- Leeville Hydrologic Monitoring Plan (LHMP): Since 2003, Newmont has been reporting the results of ongoing monitoring of water resources in the vicinity of the Leeville Project under the auspices of the LHMP. Results of this monitoring program are included in the MCBMP monitoring reports.

- Boulder Valley Monitoring Plan (BVMP): Since 1990, Barrick has conducted monthly monitoring reported semi-annually of surface water and groundwater in Boulder Valley related to mining activities primarily at the Betze/Post Mine (Barrick 1990, 2007a). Surface water monitoring stations are located on Bell Creek, Brush Creek, Antelope Creek, Boulder Creek, Rodeo Creek, and Rock Creek. Groundwater monitoring wells and springs are also included in the Plan. These sites are monitored for surface water flow, depth to groundwater, and/or quality characteristics.

- Spring Survey by Barrick: Annual spring and seep monitoring is performed, characterizing chemistry, flow rates, and vegetation at 35 sites located in the Tuscarora Mountains (AATA International, Inc. 2009).

- Spring Survey by Newmont: Since 1990, Newmont has been monitoring springs and seeps in the same four hydrographic basins mentioned above as part of Gold Quarry Mine monitoring. A total of 33 springs are monitored annually in the fall. Thirteen of these are required by BLM in either the SOAPA Final EIS (BLM 2002a) or Leeville Final EIS (2002b). Monitoring consists of measuring flow and characterizing water quality and general site conditions (Newmont 2009c).

- The BLM Elko District Office has conducted lentic (springs, seeps, and pond) and lotic (streams) assessments at selected grazing allotments in the Carlin Trend and surrounding areas. These assessments primarily address effects of livestock grazing on springs, seeps, ponds, and streams.



N
W E
S

0 2.5 5 10
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Hydrographic Sub-basins
- Cumulative Effects Study Area

Area of Predicted Groundwater Drawdown In Water Table Aquifer Due To Dewatering of All Carlin Trend

- Updated 2007 Carlin Trend Model
- CIA Model (BLM 2000)

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

WATER QUANTITY AND QUALITY
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-5

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig_3-2_Water_Resources.mxd

All water resources monitoring data are made available in semi-annual monitoring reports submitted by Barrick and Newmont to the BLM, NDEP, and Nevada Division of Water Resources (NDWR). Some surface water stations in the Study Area are maintained by the U.S. Geological Survey (USGS 2009; Newmont 2009b).

Groundwater Quantity

As documented in the CIA report (BLM 2000) and MCBMP (Newmont 2009b), results of groundwater level monitoring show that drawdown has been occurring in a large portion of the Study Area, beginning between 1988 and 1990 for the Betze/Post and Gold Quarry mines. Dewatering at the Leeville Mine began in 2003. Around Leeville, up to 1,000 feet of groundwater drawdown has occurred in the lower plate carbonate rocks, and up to 200 feet of drawdown has occurred in the upper plate siltstone rocks (Newmont 2009b). About 800 feet of groundwater drawdown has occurred in the Gold Quarry Mine area (Newmont 2009b). By the end of mine life, maximum groundwater drawdown due to dewatering is expected to be approximately 1,700 feet in the vicinity of the Betze/Post Mine; 1,400 feet in the vicinity of Gold Quarry Mine (BLM 2002b); and 1,900 feet in the vicinity of Leeville Mine (BLM 2002a).

For the Gold Quarry and Leeville mines, average pumping rates during the six-month period consisting of 4th quarter 2008 and 1st quarter 2009 were approximately 23,000 and 18,000 gpm, respectively (Newmont 2009b). In 2007, average groundwater pumping rates for the Gold Quarry and Leeville mines were 14,000 and 13,000 gpm, respectively (Newmont 2008b). In comparison, the average pumping rate was 11,200 gpm from Gold Quarry in 2000, and 5,300 gpm from Leeville in 2003 (Paine 2007).

For the Betze/Post Mine, the average groundwater pumping rate during 4th quarter 2006 and 1st quarter 2007 was 18,000 gpm (Barrick 2007a).

Not all groundwater pumped for mine dewatering is lost to the water balance of the affected hydrologic basins because a percentage of the pumped water is reinfiltrated. Over 50 percent of pumped groundwater typically is infiltrated for the Betze/Post and Leeville mines, with less than 10 percent of pumped groundwater being subject to infiltration from the Gold Quarry Mine.

Two general areas of water infiltration and groundwater mounding in the Study Area are (1) TS Reservoir area and irrigated fields in the Boulder Valley; and (2) Maggie Creek Reservoir and irrigated Hadley fields in the Maggie Creek Valley. The Leeville and Betze/Post mines contribute to infiltration in Boulder Valley, and Gold Quarry dewatering provides infiltration water in Maggie Creek Valley. Up to 55 feet of groundwater mounding has been documented in the vicinity of the two reservoir sites (HCltasca 2009).

The TS Power Plant is located 3 miles north of Dunphy in the Boulder Valley. Groundwater pumping wells to supply makeup water needs for the plant are located approximately 12 miles north of the Humboldt River in Boulder Valley. Average groundwater pumping for the power plant is approximately 5.3 cfs or 2,400 gpm for its expected 50-year life (HCl 2007).

At the time the CIA report (BLM 2000) was prepared, numerical models were used to predict maximum extent of groundwater drawdown due to dewatering at the Gold Quarry, Betze/Post, and Leeville mines. Since that time, HCl has updated the Newmont model (i.e. Carlin Trend model) every two years, with the most recent update performed in 2009 (HCltasca) 2009). Dewatering associated with the Hollister Development

Block Exploration Project (underground exploration decline) has not been included in the numerical models. Dewatering at Hollister ranges from 900 to 1,000 gpm and would not be expected to have a measurable effect on groundwater drawdown in the Study Area. The Hollister Development Block project is located within the area of predicted drawdown resulting from cumulative dewatering on the Carlin Trend (HCltasca 2009).

Using the Carlin Trend numerical flow model, dewatering predictions for years 2009 through 2016 show that the maximum future pumping rate for the Gold Quarry Mine would be about 17,500 gpm (HCltasca 2009). Similarly, the predicted maximum future pumping rate for for the Leeville Mine through year 2019 would be about 24,000 gpm (HCltasca 2009).

Surface Water Quantity

Surface water flow in the Humboldt River and area streams can potentially increase due to mine discharges of excess dewatering water, or decrease due to dewatering activities that intercept groundwater that normally recharges these water bodies. Since 2000, flow rates for streams and the Humboldt River have remained within natural fluctuation ranges. Surface water flow hydrographs for Antelope, Bell, Boulder, Brush, Rock, and Rodeo creeks are presented in the Boulder Valley Monitoring Plan (Barrick 2007a). Hydrographs for gaging stations on the Humboldt River, Maggie Creek, Susie Creek, and Marys Creek are provided in the MCBMP (Newmont 1992, 2009b). No discharges of mine dewatering water to the Humboldt River via the Boulder Valley conveyance system have occurred since February 3, 1999.

Based on the CIA report (BLM 2000), a total of approximately 537 springs were identified within the predicted cumulative groundwater drawdown area in the Study Area. Of these, 186 springs were predicted to not be affected because they were located above 6000 feet amsl. Approximately 182 springs are located in areas where perennial surface water flow is predicted to be impacted by dewatering and drawdown of the groundwater table. Currently, 33 of these springs/seeps are monitored by Newmont (1992, 2009c) in the vicinity of the Gold Quarry and Leeville mines, and 35 springs/seeps are monitored by Barrick (AATA 2009) in the vicinity of the Betze/Post Mine. Most of these springs have been monitored annually or more frequently starting in the early 1990s. Initial surveys included a spring and fall sampling event; however, most spring/seep monitoring is now conducted only in the fall. All surface water monitoring results are provided to the BLM, NDEP, and NDWR in semi-annual or annual reports.

Surface water rights, including springs, within the Study Area are described in the Leeville Project EIS (BLM 2002a); SOAPA EIS (BLM 2002b), and CIA report (BLM 2000). Primary uses for surface water are stock watering, municipal, irrigation, and domestic. According to the CIA report (BLM 2000), a total of 121 surface water rights were recorded for the Study Area. Of these water rights, four notifications of public water reserve were filed for springs under the 1926 Executive Order, Order of Withdrawal, Public Water Reserve No. 107 (PWR 107). These four springs are located outside the area of predicted groundwater drawdown and are not expected to be affected by mine dewatering activities.

The Humboldt River adjudication appropriated water tributary to the Humboldt River. The Humboldt River was adjudicated under the Bartlett (October 20, 1931), Edwards (October 7, 1935), and the Nevada State Supreme Court (December 7, 1937) decrees.

Groundwater Quality

Assessment of the effects of Gold Quarry and Leeville mine operations on groundwater quality are provided by monitoring data generated by sampling and analyzing water samples quarterly from monitoring and dewatering wells at the Newmont mines. These results are reported semi-annually in accordance with Newmont's Maggie Creek Basin Monitoring Plan (Newmont 2009b). Similarly, monitoring wells in the vicinity of the Betze/Post Mine are sampled and analyzed quarterly by Barrick as part of its Boulder Valley Monitoring Plan (Barrick 1990), with data reports submitted semi-annually to the agencies.

With the exception of arsenic in bedrock units, groundwater concentrations of all parameters generally are below Nevada's primary drinking water standards. Groundwater quality analytical results obtained quarterly for wells remain virtually unchanged at Gold Quarry, Leeville, and Betze/Post mines, with no discernable trend establishing degradation of water quality due to mining or other activities (Newmont 2009b; Barrick 2007a). Elevated arsenic concentrations in groundwater from some bedrock wells in the Study Area represent naturally occurring concentrations in deep mineralized zones.

Surface Water Quality

Surface water quality samples collected quarterly in the Study Area, with analytical results submitted semi-annually, remain virtually unchanged with no discernable trend establishing degradation of water quality due to mining or other activities (Newmont 2009b; Barrick 2007a).

The Humboldt River and several tributary streams in the Study Area are listed as impaired on the EPA's 2006 303(d) list of impaired water bodies (NDEP 2009b). With respect to the Study Area, the Humboldt River is designated as impaired from Palisade to Battle Mountain, with the pollutants of concern listed as iron and turbidity. Maggie Creek is listed for phosphorus (upper creek) and pH (lower creek); and Willow Creek is listed for temperature (NDEP 2009b). To date, NDEP (2009b) has established Total Maximum Daily Loads (TMDLs) for total phosphorus and total suspended solids for the Humboldt River from Palisade to Battle Mountain.

CUMULATIVE EFFECTS

Cumulative effects on water resources can result from: (1) mine dewatering; (2) discharge of excess mine water; (3) land disturbance; (4) development of pit lakes; (5) grazing activities; (6) replacement of riparian/wetland plant communities with invasive non-native plants; and (7) wildfires. These activities can affect surface water and groundwater quantity and quality in the Study Area (BLM 2000).

Water Quantity

Newmont's Gold Quarry and Leeville projects and Barrick's Betze/Post and Meikle mines account for most of the dewatering projected to occur in the foreseeable future in the Study Area. The combined cones-of-depression in groundwater created by dewatering would create additive effects in regional groundwater drawdown.

Numerical groundwater models used to predict the maximum extent of cumulative groundwater drawdown, and results of those models, are included in the CIA report (BLM 2000), and in EIS documents for Leeville and SOAPA (BLM 2002a, 2002b). The Carlin Trend groundwater model is calibrated every two years and updated using more recent hydrologic data. The most recent model update (HCltasca 2009) shows that the maximum extent of the predicted 10-ft drawdown contour line or isopleth due to all Carlin Trend dewatering will

be smaller than those predicted previously for the Leeville Project EIS (BLM 2002a), SOAPA EIS (BLM 2002b), and the CIA report (BLM 2000). The 10-ft drawdown line for the 2009 model, however, is similar to results from the 2007 and 2004 Carlin Trend model runs (HCltasca 2009).

Figure 3-5 shows the maximum extent of 10-ft drawdown depicted for the Carlin Trend and the updated modeled drawdown area presented by HCltasca (2009). The reduced size of the updated groundwater drawdown area predicted by the 2009 model as compared to the 2002 SOAPA EIS model is primarily in the northern portion into the Tuscarora Range (north of Leeville Mine) and in the southern portion across Marys Mountain (south-southwest of Gold Quarry Mine).

As previously mentioned, dewatering from the Hollister Development Block Project (underground decline) has not been included in the groundwater models; however, the effect of this relatively low dewatering rate (900 to 1,000 gpm) would not have a measurable influence on cumulative groundwater drawdown in the Study Area.

Surface Water Flows

Few surface water flow impacts (including those to streams, rivers, and springs) resulting from mine dewatering in the Study Area have been documented in over 15 years of monitoring (Newmont 2009b; Barrick 2007a). As discussed in the CIA report (BLM 2000), flow in some stream reaches could be reduced as a result of mine-induced drawdown, including lower Maggie Creek, lower Marys Creek, lower Susie Creek, Rock Creek, and Boulder Creek.

The most recent groundwater model update by HCltasca (2009) shows the following predicted effects on the Humboldt River and tributary streams in the Study Area due to all Carlin Trend mine dewatering; no effect on base flows is predicted for the upper reaches of Susie and Marys creeks:

- Less decrease of base flow in Marys Creek, Maggie Creek, and the Humboldt River than was predicted for the SOAPA EIS (BLM 2002b).

- Lower Maggie Creek impacts are similar to those predicted during the SOAPA EIS. During mining operations at Gold Quarry, base flow would increase due to dewatering discharge, varying from about 3 to 35 cubic feet per second (cfs). After this period of discharge, natural base flow conditions of no flow would resume near the Humboldt River.

- In upper Maggie Creek between Jack Creek and the upper end of Maggie Creek Canyon, the 2009 Carlin Trend model predicts a maximum decrease of 0.5 cfs in about year 2045. The SOAPA EIS model had predicted a maximum decrease in upper Maggie Creek base flow of 0.6 cfs.

- Magnitude of decreases in lower Susie Creek flow are identical to those predicted for the SOAPA EIS, but the length of time that mine dewatering may affect lower Susie Creek has been extended by 20 years, with no base flow occurring between 2030 and 2090.

- Marys Creek is predicted to have a smaller decrease in base flow than was predicted for the SOAPA EIS (base flow reduction of up to about 1 cfs between years 2040 and 2050, compared to a predicted reduction of about 1.7 cfs for the SOAPA EIS).

- Beaver Creek base flow is predicted to have a decrease similar to that predicted in the Leeville EIS; the decrease is relatively minor (0.05 cfs).

- Base flow in the Humboldt River at Dunphy would decrease by a maximum of 3.4 cfs after cessation of mine dewatering in the Carlin Trend in year 2043; this is a reduction of impact previously predicted for the SOAPA EIS (predicted base flow reduction of about 4.9 cfs) and the BLM (2000) CIA report (predicted reduction of about 8 cfs). The long-term decrease in base flow between the Carlin Tunnels and Dunphy gages is predicted to be about 1.1 cfs. As previously discussed, Humboldt River base flow will increase during periods of excess mine water discharges to the river.

To date, surface water flow impacts resulting from mine dewatering have not been documented in over 15 years of monitoring with the following previously documented exceptions:

- Brush Creek: Reduced flow and drying of springs and stream flow, and effects on vegetation have been noted along portions of Brush Creek since 1993 (BLM 2000). Brush Creek is a tributary of Rodeo Creek in the Boulder Valley.

- Maggie Creek at Narrows: Beginning in the 1990s, dewatering associated with the Gold Quarry has affected flows in the narrows of Maggie Creek (BLM 2002b), with continuing reductions in observed flows (Newmont 2009b).

- Susie Creek: At the USGS gage above its confluence with the Humboldt River, Susie Creek flow decreased during the last quarter of 2008 and first quarter of 2009 (Newmont 2009b).

Trigger values for in-stream flow volumes that would require augmentation of flow as defined in mine site mitigation plans have not been reached to date, and therefore, no augmentation of in-stream flow has been required. Adverse effects to some surface water rights may occur if flow reductions occur in Study Area streams and/or the Humboldt River.

Predicted groundwater withdrawals for the TS Power Plant are not expected to have a measurable change on Humboldt River flows (ENSR 2004a; HCI 2007). A model performed by HCI (2007) shows a predicted decrease of 0.24 cfs or 110 gpm in Humboldt River flow between the Palisades and Battle Mountain gages due to pumping for the power plant. Average groundwater pumping for the power plant is approximately 5.3 cfs or 2,400 gpm for its expected 50-year life (HCI 2007).

Spring/Seep Flows

Based on the CIA (BLM 2000), a total of 182 springs in the Study Area are located in areas where surface water flow could potentially be impacted by mine dewatering in the Carlin Trend. Review of flow data indicates no substantial change in flow rates for 29 of the 33 springs currently monitored by Newmont in the vicinity of the Gold Quarry and Leeville mines. Four springs have exhibited variation in flow, reduction in flow, or have gone dry for one or more years. Groundwater monitoring at established "trigger" wells has not indicated any drawdown from mine dewatering operations in the direction of these springs (Newmont 2009b, 2009c). Hydrologic investigations have identified

grazing, evolving streambed morphology, and anthropogenic flow controls as the primary factors influencing flow measurements at these springs.

Monitoring by Barrick for the Betze/Post Mine area indicates that four of the 23 springs monitored within the Study Area are consistently dry, and one spring shows decreased flow rates (AATA 2009).

It is expected that fewer springs/seeps could potentially be affected by cumulative groundwater drawdown than were originally identified in the CIA report (BLM 2000). All springs and seeps determined as being potentially affected by groundwater drawdown are located below an elevation of approximately 6,000 feet. The updated numerical groundwater flow model (HCltasca 2009) shows a smaller projected drawdown area as compared to the 2002 SOAPA EIS (BLM 2002b) version of the model. The areas eliminated from predicted groundwater drawdown in the more recent versions of the model are located south-southwest of the Gold Quarry Mine (Marys Creek, James Creek, and Welches Creek areas), and north of the Leeville Mine (west of upper Maggie Creek) (HCltasca 2009).

Of the seeps and springs that could potentially be impacted from cumulative drawdown, analysis of the groundwater drawdown model projected that five of these springs may be incrementally impacted by SOAPA dewatering (BLM 2002b). No incremental impact to springs/seeps would occur as a result of mine dewatering at Leeville (BLM 2002a). None of the five springs potentially impacted by SOAPA would qualify as a PWR 107 water right since four of the springs occur on private land, and the water right for the remaining spring pre-dates PWR 107. Additionally, both Barrick and Newmont have obligations to mitigate loss of flow from mine dewatering at selected springs/seeps in the cumulative drawdown area.

Groundwater Levels

As previously discussed, the most recent groundwater model update (HCltasca 2009) shows that the maximum extent of the predicted 10-ft drawdown isopleth due to all Carlin Trend dewatering is similar to the model predictions in 2004 and 2007, and smaller than predicted by the Carlin Trend model for the 2002 SOAPA EIS (BLM 2002b) (**Figure 3-5**).

Continued mine dewatering at Gold Quarry through year 2016, Betze/Post through 2015, and Leeville through 2019 will result in continued expansion of the cumulative groundwater cone-of-depression beyond its current configuration (HCltasca 2009). The rates of groundwater drawdown from 2000-2009 are generally less than rates that occurred during early stages of dewatering prior to 2000. Prior to 2000, Carlin Trend pumping rates typically were higher in order to achieve sufficient lowering of the groundwater table to keep the advancing mine pits and underground workings relatively dry.

Dewatering at the Gold Quarry Mine started in 1992; whereas, dewatering at Betze/Post was initiated in 1990. Dewatering at Leeville did not start until 2003; however, groundwater in this area was already being lowered at that time due to the nearby Betze/Post Mine operations.

Maximum groundwater drawdown resulting from pumping at the TS Power Plant in Boulder Valley is predicted to be about 19 feet by year 2057. Average pumping rate for power plant makeup water is about 2,400 gpm from wells located in Boulder Valley (ENSR 2004b).

To date, groundwater drawdown measured in piezometers MK-1, MK-2, and CV-10, located north of SOAPA in alluvium or valley fill deposits (*i.e.*, Carlin Formation), has occurred gradually over the period of record (since 1993). Total water level decline in these

piezometers has been less than 15 feet. No other drawdown trends have been recorded in valley fill deposits.

Impacts to groundwater rights associated with wells may occur where water levels decline such that water yield is reduced or a pump must be lowered to keep it in water. Water rights are administered and protected by the State Engineer.

Water Quality

Runoff and drainage from waste rock storage facilities, leach pads, tailing impoundments, process ponds and other mine-related facilities could potentially impact both surface or groundwater quality in the Study Area. To date, with the exception of Rodeo Creek Gold Co.'s Hollister Development Block Project, none of the water monitoring stations in the Study Area has reported evidence of acid-rock drainage or elevated levels of metals. The South overburden stockpile at Hollister has generated acid in the past. Conditions that created the acid drainage have been addressed through a combination of improved surface water control measures that divert water that once reported, in part, to the stockpile, re-contouring to maximize shedding meteoric water, incorporating lime into cover material used to cap the stockpile, and installation of a collection and treatment system. Residual flow from the stockpile has elevated sulfate levels; this water reports to a constructed wetland where the water is consumed.

Acid-rock drainage has occurred at refractory ore stockpiles at Newmont's South Operations Area. This drainage is captured and used in ore processing. Refractory ore stockpiles may be a source of acid drainage over the life of the operation, but these stockpiles will be removed prior to project closure and, therefore, have a relatively short-term potential for producing acid drainage. Runoff or drainage from permanent facilities in the Study Area is unlikely, primarily due to encapsulation of any identified potentially acid producing rock. Future impacts to surface water would likely be recorded at one of the many water quality monitoring sites within the Study Area. Monitoring results are presented in Water Pollution Control Permits (Newmont 2007d; Barrick 2007c), Maggie Creek Basin Monitoring Plan (Newmont 2009b), and Boulder Valley Monitoring Plan (Barrick 2007a) reports.

Erosion of mine-related land disturbances can result in increased sedimentation to surface water bodies in the Study Area. All mine projects have storm water permits that incorporate best management practices (BMPs) to control erosion and capture runoff from disturbed areas. No data have been collected to quantify sediment loss from mine areas. NDEP conducts regular inspections of sediment control systems to ensure compliance with storm water permits. Reclamation of disturbed areas during and after mining will manage potential long term erosion and sedimentation from mine sites.

Wildfires and flooding, especially between 2001 and 2006, have resulted in impacts to Maggie and Susie creek basins including short-term increases in erosion and sedimentation to nearby surface water drainages. Other water quality impairments specified in Nevada's 2006 303(d) list of impaired water bodies (NDEP 2009b) for Maggie Creek (phosphorus and pH), Willow Creek (temperature), and the Humboldt River (iron and turbidity). To date, NDEP (2009b) has established TMDLs for total phosphorus and total suspended solids for the Humboldt River from Palisade to Battle Mountain.

Impacts to water quality within the Study Area also occur as a result of agricultural use. Grazing along stream corridors can result in a loss of bank stability, erosion, and sedimentation.

Impacts to water quality include increasing suspended solids and turbidity, increasing temperature, decreasing riparian vegetation, and a variety of other effects (see *Riparian Areas and Wetlands* section in this chapter). Diversion of water for irrigation also potentially impacts water quality by increasing water temperature, as well as introducing a number of agricultural contaminants via return flow.

Other non-mining land uses such as recreation and transportation also contribute cumulatively to water quality impacts. These activities add to surface disturbance which increases potential of erosion and sedimentation of surface water resources.

Development of mine pit lakes and saturation of underground mine workings after cessation of mining have the potential to cumulatively impact groundwater quality in the Carlin Trend. Concentrations of total dissolved solids, sulfate, nitrate, and some metals may be elevated, at least in the short-term, for water that comes into contact with some mine pit walls and underground workings. These water quality conditions can be quite variable, depending on local conditions, including rock type, mineral composition, exposure to weathering, amount of rock submerged below the water surface, presence of potentially acid-generating rock, chemical equilibrium conditions, and pit lake turn-over. Comprehensive monitoring of evolving pit lake chemistry will be conducted by the mine operators.

Pit lakes that ultimately develop in the Gold Quarry and Betze/Post pits are not expected to discharge to ground surface and, therefore, would not directly affect surface water quality. Additionally, these pit lakes are expected to be long-term hydraulic sinks due to high evaporation rates and relatively low groundwater inflow rates when filled, thereby preventing potential impacts to surrounding groundwater quality.

For the Study Area, inflowing groundwater to pit lakes typically have sufficient alkalinity to maintain neutral pH conditions for the long-term (*i.e.*, high buffering capacity). In addition, most underground workings will be backfilled with cemented rock aggregate consisting of neutral or acid-neutralizing material. Evaporation from the pit lake surface generally would concentrate levels of total dissolved solids, sulfate, and other major ions in the water. Precipitation of ferric hydroxide in pit lakes, however, acts to continually remove some metals from solution.

Geochemical modeling conducted to predict the quality of water that would ultimately remain in the Gold Quarry pit indicated that the water quality would be of similar quality than existing groundwater in the vicinity of the pit (Geomega 2001). The quality of the water would be influenced by carbonate rock exposed in the pit that would buffer development of acidic conditions; removal of a large portion of the mineralized zone due to mining would reduce the amount sulfides that would be exposed in pit walls; and adsorption and deposition of trace metals on ferric hydroxides would reduce the concentration of trace metals in pit lake water. Pit lake water is predicted to be alkaline with cadmium and selenium exceeding the 96-hour average aquatic life standard but not exceeding the 1-hour standard. Molybdenum is predicted to exceed both standards. The Gold Quarry pit is expected to have an ultimate pit depth of 1,370 feet with a lake surface elevation of 5091 feet amsl. The pit lake is expected to require 150 years to form to this level with 95 percent of this recovery occurring in the first 60 years after cessation of dewatering (HCI 1999).

Geochemical modeling by Geomega (2007) predicts that the Tara pit lake would have a near-neutral pH, arsenic concentrations less than influent groundwater, and antimony concentrations less than the Nevada municipal

domestic supply standard. The lake will not form until around year 2136 and will have consistently good water quality, comparable to existing groundwater in the Carlin Trend.

A study of the Betze/Post pit lake predicts that water would have a near-neutral pH, with the possible exception of acidic conditions during the early period of pit lake filling (BLM 2003). Also for the Betze/Post pit lake, concentrations of total dissolved solids, sulfate, and antimony are predicted to exceed drinking water standards (BLM 2003).

Pit lakes are not intended to be used for drinking water (humans and livestock), recreational swimming, or fisheries. Therefore, water quality standards for drinking water, livestock use, recreational use, and aquatic life are generally not applicable to pit lakes. These water bodies, however, could be accessed by waterfowl and wildlife. An evaluation of potential impacts to these receptors for the Betze/Post pit indicates that ingestion of pit lake water by waterfowl or wildlife would not result in adverse effects (BLM 2003).

Restoration Projects

Water quality improvements due to stream and habitat restoration efforts are documented in the site monitoring programs and reports. An example is total suspended solids (TSS) versus stream flow in Maggie Creek, where TSS has been lowered over time, likely as a result of re-vegetation and stabilization of stream banks. This in turn, improves habitat quality for aquatic life and sediment sensitive species such as Lahontan cutthroat trout.

Improvement and expansion of riparian/wetland in the Maggie Creek drainage due to the Maggie Creek Watershed Restoration Project has occurred since implementation of the program. Development of healthy, well-developed riparian zones in the Maggie Creek drainage has slowed water and dissipated energy during periods of high flow (Trout Unlimited 2007b), resulting in capture of sediment, development of floodplains, and overall habitat improvement. Reduced sediment loads reflect improved filtering capacity of a healthy, well-established riparian zone. Flooding in 2005 and 2006 caused erosion of streams throughout the Study Area; however, habitat improvements in the Maggie Creek drainage tended to moderate impacts.

The Upper Willow Creek Habitat Enhancement Plan area (including Willow, Lewis, and Nelson Creeks) is within the vicinity of, but external to, the area of potential impact from mine dewatering (CCA 2004). This Habitat Enhancement Plan has resulted in a watershed with improvements for aquatic organisms and sediment levels in the Willow/Rock Creek drainage (CCA 2004). Setbacks were experienced in 2005 and 2006 due to range fires and flooding.

Ruby Pipeline Project

Potential impact to surface water would result from temporary increase in sediment during in-stream construction of the Ruby Pipeline. Construction during low/no flow periods would minimize sedimentation and turbidity, streambank and bed disturbances, and limit the time it takes to complete in-stream construction.

Construction of the Ruby Pipeline would involve excavation of a trench to a typical depth of six feet and have no effect on groundwater resources in the Study Area.

Hydrostatic testing of the pipeline would be in accordance with applicable water withdrawal and National Pollutant Discharge Elimination System (NPDES) permits.

SOIL RESOURCES

Information on soil resources in the Study Area is developed on a project specific basis through soil surveys. Surveys include various levels of intensity depending on whether a specific tract of land is to be disturbed by the proposed mine development. Soil survey information is described in a Plan of Operations submitted by mine applicants and includes the texture of the soil, depth or thickness, chemistry (including organic matter content), coarse fragment content, aerial extent of each soil type (map), and suitability rating of the soil for reclamation.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for soil resources encompasses the Carlin Trend and watersheds that drain the Carlin Trend to the confluence with the Humboldt River. This Study Area is based on natural and manmade impacts to soil resources that result in soil movement or loss, soil fertility and productivity, and areas where additive effects of soil movement could impact other resources (e.g., surface water). The Study Area for Soil Resources is shown on **Figure 3-6.**

MONITORING DATA AND NEW INFORMATION

Additional soil data have been collected in the Study Area since 2002 in association with the TS Power Plant located in Boulder Valley.

TS Power Plant

The majority of soil located in the 600-acre TS Power Plant site is mapped as Dunphy, which is a silt loam that varies between slightly saline to strongly saline. This soil is usually in excess of 60 inches deep, moderately well-drained, and has a slight to moderate water and wind erosion hazard (USDA 1980).

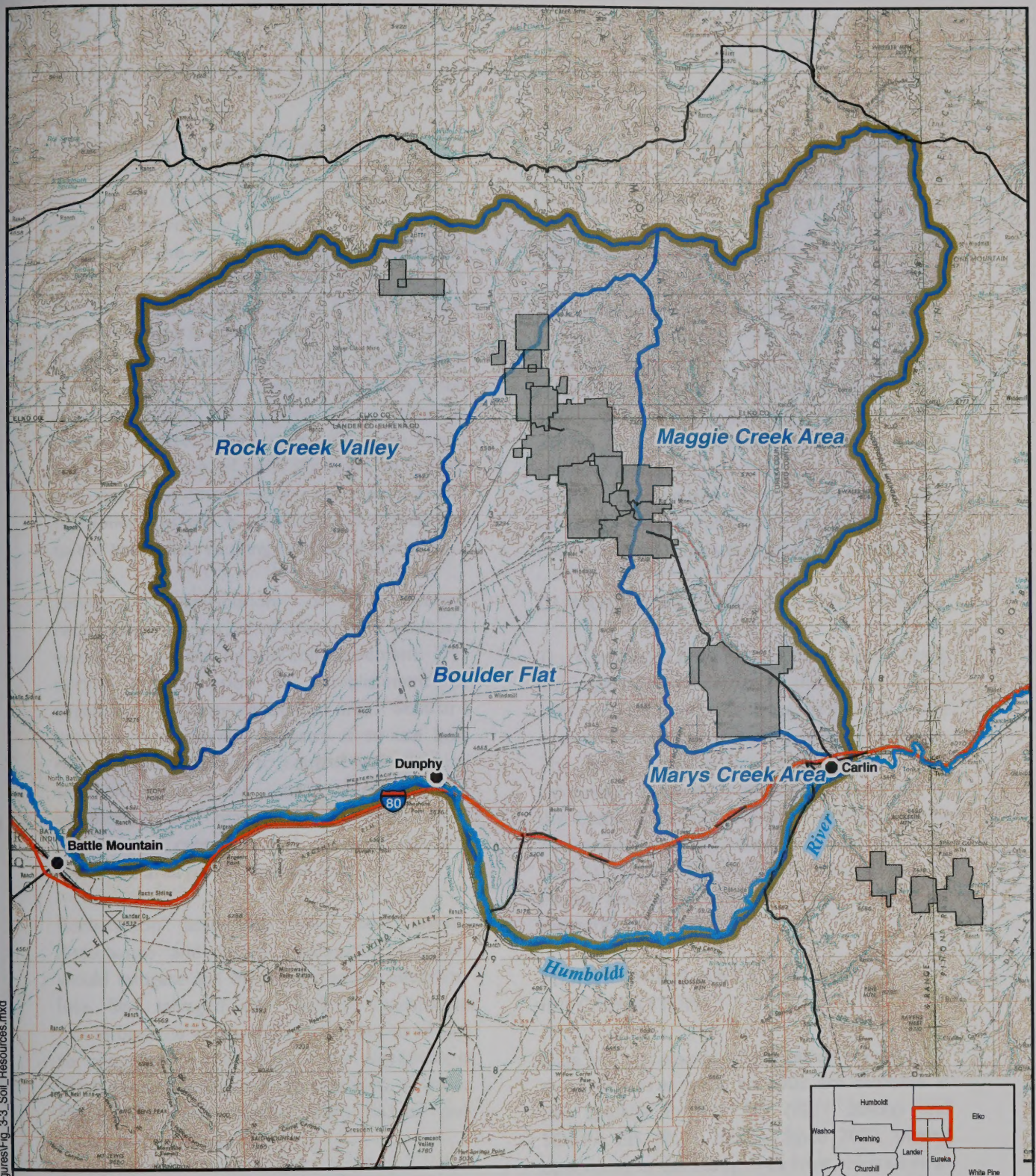
Other soil types affected by development of the power plant range in texture from silty clay to loams to silty loam to gravelly and fine sandy loams. These soil types include non-saline to strongly saline and alkali. Soil depths range from 12 to 60+ inches.

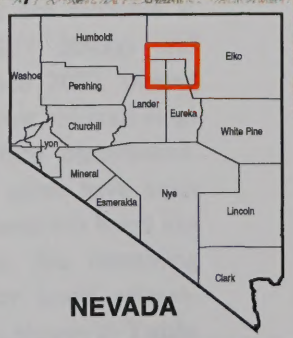
CUMULATIVE EFFECTS

Soil resources are cumulatively impacted through disturbance and/or removal by mining, fire, agriculture, recreation, and a variety of other natural and man-caused activities within the analysis area. These impacts are described in terms of the type of impact and the number of acres affected. Consideration is also given to the amount of those acres which are likely to be reclaimed.

Tables 2-1 and **2-3** in Chapter 2 –*Mine and Mineral Development*, provide information on past, present, and reasonably foreseeable activities in the vicinity of the Carlin Trend. Mining and livestock grazing are expected to continue as major activities in the Study Area and impacts to soil resources from wildfire in the area would also continue to occur. Impacts from these activities include loss of soil productivity due to changes in soil physical properties, soil fertility, soil movement in response to water and wind erosion, and loss of soil structure due to compaction

In addition to mining activities in the Study Area, several years of major wildfires have occurred, creating additional regional impacts to soil. Burned areas with damaged or destroyed vegetation are susceptible to soil erosion by wind and water. Emergency and remedial seeding has taken place in order to minimize soil erosion and stabilize surfaces. An undetermined amount of soil has eroded into drainages and waterways as a result of fire. Movement of soil from burn areas is dependent on weather conditions, duration of exposure, and success of seeding efforts to establish vegetative cover.





N
W E
S

0 2.5 5 10
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Hydrographic Sub-basins
- Cumulative Effects Study Area

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

SOIL RESOURCES
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-6

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig_3-3_Soil_Resources.mxd

Mine construction and development practices in the Study Area include salvage and stockpile of soil for use in reclamation. Topsoil stripping occurs immediately following clearing and grubbing of the surface area and therefore, the time period between exposure of bare mineral soil to wind and water erosion is minimized. Soil movement is most evident from stockpiles of soil prior to establishment of cover crops. Once cover crops are established, soil movement from the surface of stockpiles is minimized. Also, standard practice is to install berms at the toe of each stockpile to collect soil that may move from the face of the stockpile. This soil is captured and is returned to the stockpile; resulting in minimal loss of soil.

Similarly, redistribution of soil during reclamation is a period of time where wind and water erosion can initiate soil movement. This period occurs prior to establishment of vegetation on the reclaimed area. Standard practice in the mining industry is to use best management practices to control and minimize sediment movement until vegetation is established. Best management practices allow soil to be captured and returned to the reclaimed area minimizing soil loss.

Reclamation associated with past mining disturbance and future restoration activities would mitigate soil movement and productivity loss. Soil salvaged and used in reclamation would become viable and is expected to return to pre-mining productivity once vegetation is established. Seeding and revegetation of areas that have been burned will reduce soil movement and loss.

Data that quantify cumulative soil movement that result in soil loss in the Study Area from all land surfaces (mine areas, burn areas, grazing areas) are not available. As described above, soil movement in response to any of the land disturbing activities or phenomena are site specific, weather dependent, and subject to response to the timing and success of rehabilitation efforts.

VEGETATION RESOURCES

The cumulative effects discussion for vegetation focuses on changes in dominant plant communities that effect habitat for wildlife (*i.e.*, sagebrush/grasslands). Wildfires combined with displacement of native species by invasive annual grasses are the primary factors that have altered the structure, composition, and ecology of plant communities in the Study Area. One species of sensitive plant that may be present in the Study Area, Lewis buckwheat, is addressed.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for vegetation encompasses the Carlin Trend and extends north and east to include mule deer and pronghorn antelope seasonal habitats. The Study Area includes past, present, and reasonably foreseeable mining developments in the Carlin Trend and includes a contiguous area that provides crucial seasonal habitat for mule deer, a species of concern because of loss of habitat associated with cumulative impacts on vegetation from wildfires.

MONITORING DATA AND NEW INFORMATION

Data and discussions of vegetation resources in the Study Area prior to 2002 are available in the Leeville Project EIS (BLM 2002a) and SOAPA EIS (BLM 2002b). Since 2002, mining operations in the Study Area have resulted in an additional 7,800 acres of surface disturbance. To date, approximately 1,920 acres have been reclaimed. Of these acres, reclamation bond has been released on 833 acres; the remaining acreage is pending review for bond release. Mining related disturbances are shown in **Table 2-1** in Chapter 2.

Since 1999, wildfires have burned nearly 942,000 acres of sagebrush and grassland habitat as shown on **Figure 2-4**. Areas damaged by wildfire and efforts to mitigate effects of fire are described in Chapter 2 – *Wildfires and Reseeding.*

CUMULATIVE EFFECTS

The primary past, present, and reasonably foreseeable changes that have affected vegetation in the Study Area include wildfires, mining and exploration activity. Existing mining and exploration projects are listed in **Table 2-1** and reasonably foreseeable mine development in the Carlin Trend from 2010 to 2020 is shown in **Table 2-3**.

Reclamation of mine-related disturbance in the Study Area will be incremental as various operations reach the end of mining and begin closure activities. Approximately 33,500 acres of mine disturbance is permitted or has occurred within the Study Area, of which about 7,800 acres would remain as open pits; some pits would be partially filled with water. Approximately 25,700 acres would be reclaimed to pre-mining conditions (BLM 2010a). Areas affected by mining on public land will be reclaimed to BLM standards and monitored to assess success of reclamation.

Vegetation on reclaimed areas likely would be dominated by grasses with low densities of native forbs and shrubs. Typically, communities of big sagebrush, the most extensive pre-mining plant community, have proven difficult to re-establish on reclaimed land (Schuman and Booth 1998; Vicklund *et al.* 2004). Establishment of big sagebrush on reclaimed land has been shown to benefit from application of mulch, inoculation with *arbusucular mychorrizae*, reduced competition with herbaceous species (lower seeding rate of grasses and forbs), and direct-placed topsoil (Schuman and Booth 1998). *Arbuscular mychorrizae* are soil fungi that form a symbiotic relationship with roots of sagebrush and other plants, which improves drought tolerance. *Arbuscular mychorrizae* are lost when topsoil and other growth media are stockpiled.

Most reclamation plans do not specify measures that favor establishment of big sagebrush over herbaceous species; consequently, plant communities that develop on reclaimed land would likely be dominated by herbaceous species. Once a dense cover of herbaceous species has developed, it is unlikely that natural colonization by big sagebrush would successfully increase sagebrush densities to pre-mining levels. Sagebrush seedlings do not compete effectively with grasses and forbs. Mitigation measures to enhance re-establishment of sagebrush would increase the density of sagebrush on reclamation sites and decrease the time required to establish sagebrush communities comparable to pre-mining levels.

Although post-mining vegetation may have lower densities of sagebrush and other shrubs than pre-mining vegetation, it is likely that stable and self-sustaining plant communities would develop on reclaimed land. Ross (2000) reports that successful revegetation is the norm even in the driest, hottest parts of Nevada and there is no area in the state where perennial native species have not been re-established after mining, at a cover and density equal to or greater than that of undisturbed areas.

Disturbed sites and recently seeded areas are candidates for invasion by undesirable species such as noxious weeds and cheatgrass. Aggressive revegetation and weed control programs are being implemented to prevent establishment of weed infestations on reclaimed sites.

Wildfires will continue to be a major factor in replacement of shrub communities by grass-dominated communities, often with a high

cheatgrass component. The cumulative effect of fires within the Study Area is more pronounced because of the increased size and intensity of recent wildfires.

The general effect in some areas of recent fires has been conversion of primarily sagebrush habitat to expanses of cheatgrass, which form a persistent, non-native, monoculture that dominates some burned areas. The continued establishment of cheatgrass will increase the likelihood of wildfire, and could change the fire regime, community composition, and structure of plant communities indefinitely. Locally and regionally, wildfires have reduced the density of shrubs and trees. Many of the woody species in the area are slow growing, requiring 15 to 20 years to re-establish.

Reseeding within the Study Area (see Chapter 2 – *Wildfires and Reseeding*) will improve vegetation structure and composition in burned areas and benefit wildlife by providing forage, cover, and nesting habitat. Large areas affected by fire may take years to re-establish native vegetation. Completed and planned sagebrush and forage planting in burned areas will benefit a diversity of wildlife species including mule deer, pronghorn, sage grouse, and pygmy rabbit by providing forage, cover, and breeding habitat.

Livestock grazing has and will continue to influence vegetation composition and structure throughout the Study Area. Potential for overgrazing may increase as land is converted to mining and transportation uses or temporarily lost to wildfire; however, adjustment of stocking rates to account for changes in land use ensures vegetation communities are not overgrazed (see *Grazing Management and Agriculture* in this Chapter). Within the Study Area, reductions in permitted grazing use has and will continue to occur as a result of mine development and wildfires; however, these impacts will be short term as subsequent reclamation of mined areas and restoration of burned sites will allow for stocking rates to return to near pre-mining/pre-burn levels.

Special Status Species

Lewis' buckwheat (*Eriogonum lewisii*) is the only sensitive species with suitable habitat in the Study Area; although it has not been documented on any sites affected by mining. The plant occurs on dry, open ridges at elevations of 6,470 to 9,720 feet (Morefield 1996). Mining activities in the Carlin Trend occur below the elevation range of this plant and have not affected it or its habitat. Widespread wildfires could pose a risk to this species; however, habitat on which it occurs does not usually support intense fires that would harm this plant.

Invasive, Non-native Species

Cumulative effects on invasive and non-native species result from wildfire, livestock use, and mining disturbance. Grazing, while reduced to accommodate conversion of rangeland to active mine operations or as a result of wildfires, will continue in the area. Continued mine exploration and expansions and wildfires open niches for invasive plant colonization and provide a means of seed transport along roadways and trails. With continued activities that disturb soil and vegetation, the potential for areas to be colonized by noxious weeds and other invasive species will increase.

An estimated 8,000 acres on public and private land within the Study Area are infested with Scotch thistle, while more than 1,000 acres are affected by hoary cress (short white top). Smaller infestations of Russian knapweed and Canada thistle are scattered along roads and drainages. The McCann Creek drainage in the northern portion of the Tuscarora Mountains is experiencing an epidemic of hoary cress

spreading into creek bottoms and uplands. The spread of weeds results in displacement of native vegetation vital to wildlife (Coca 2007).

Treatment programs to control noxious weeds are being implemented by BLM and private land owners. Since 2002, BLM has treated approximately 2,500 acres of Scotch thistle annually. Since 2005, Newmont has treated approximately 5,500 acres for Scotch thistle, salt cedar (tamarisk), and hoary cress. Treatment areas ranged from the Bootstrap Mine in the North to the Rain Mine in the South (Basin Tree Service and Pest Control, Inc. 2005, 2006, 2007). There was no treatment for invasive, non-native species in 2008. In 2009, approximately 7 acres were treated for whitetop. Future treatment for invasive, non-native species is expected to be similar too previous years.

While area ranches and mines are applying both chemical and biological control techniques, control is inadequate to keep up with the rate of spread, and adverse impacts to rangeland including upland and riparian areas are expected to increase (Coca 2007).

TERRESTRIAL WILDLIFE, T&E, CANDIDATE, AND SENSITIVE SPECIES

The cumulative effects discussion for wildlife emphasizes potential effects to mule deer, pronghorn antelope, elk (important big-game animals) and special status species (e.g., threatened, endangered, candidate, and sensitive species) for which reductions in important habitats (primarily sagebrush-grassland) have affected populations within the Study Area. Other terrestrial species associated with sagebrush-grasslands that occur within the Study Area include small mammals, passerine birds, waterfowl, and raptors, as well as amphibians, reptiles, and invertebrates. These species are described in detail in the Leeville Project EIS (BLM 2002a) and SOAPA EIS (BLM 2002b).

CUMULATIVE EFFECTS STUDY AREA

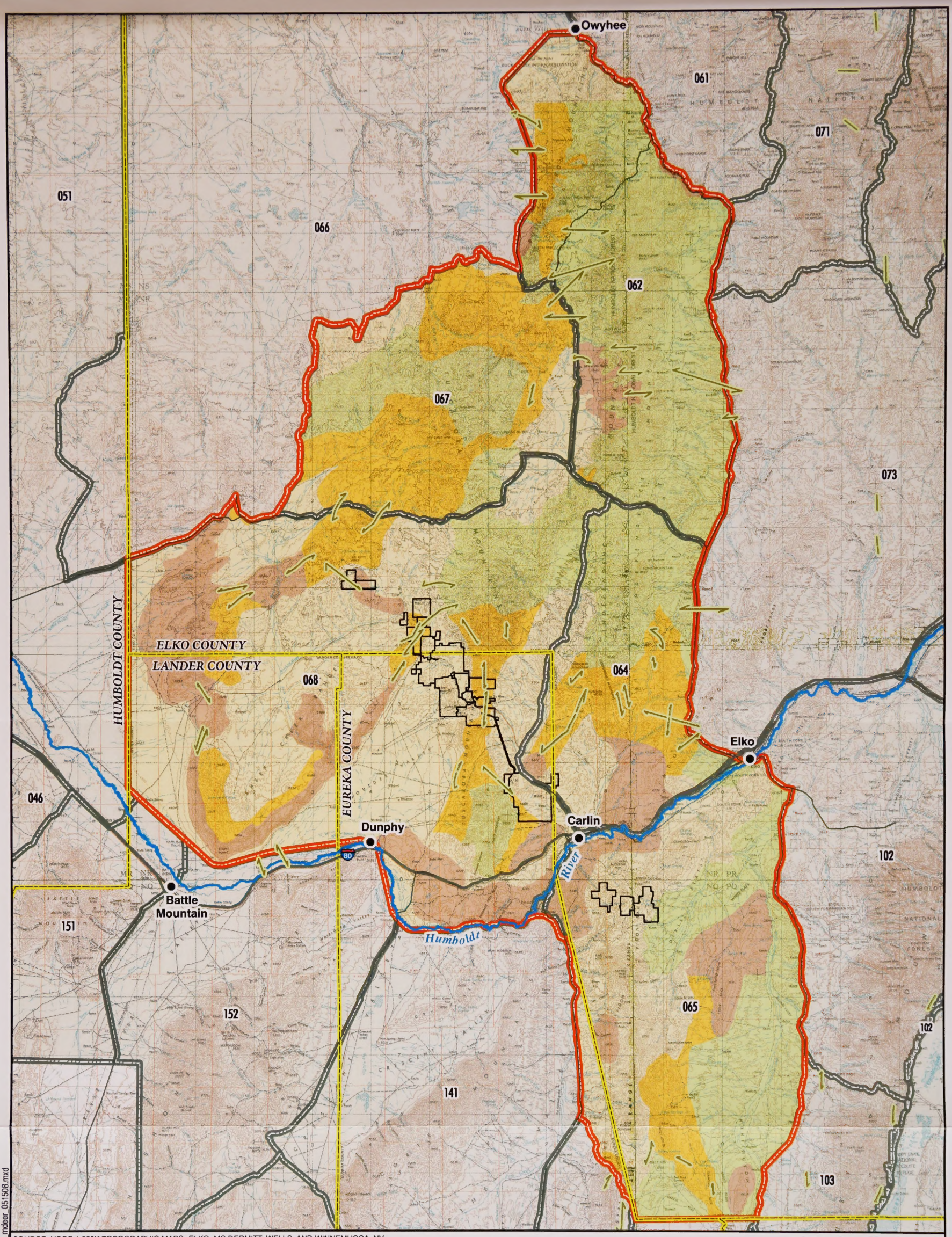
Big Game Animals

The Cumulative Effects Study Area (Study Area) for mule deer, antelope, and elk encompasses a portion of NDOW Wildlife Management Area 6 depicted in **Figure 3-7** and **Figure 3-8**. The Study Area was determined by BLM and NDOW and includes a contiguous area that provides crucial seasonal habitat for mule deer, a species of concern because of habitat losses associated with wildfires and mining. The Study Area extends from the northern end of the Independence Range in the North to southern end of the Piñon Range to the South.

Elk were first observed in the Independence Mountains portion of the Study Area in the mid-1980s and have increased to a population of approximately 290 animals (Wilkinson 2007a). Elk have been observed moving from the Maggie Creek Narrows to forage on adjacent reclaimed areas. Typically, elk are present in winter on Bob's Flat and Richmond Mountain near the southern end of the Tuscarora Mountains. Seasonal migration routes and timing of migration have not been well documented although some elk migrate to Marys Mountain during summer (Lamp 2007).

Special-Status Species

Special-status species are identified as those listed or proposed for listing as threatened or endangered under the Endangered Species Act (ESA), species that are candidates for listing under the ESA, species that are on BLM's list of Sensitive Species and State of Nevada Listed Species. Nevada BLM policy is to provide Nevada BLM Sensitive Species and State of Nevada Listed Species with the same level of protection as is provided for candidate species in BLM Manual 6840.06C.

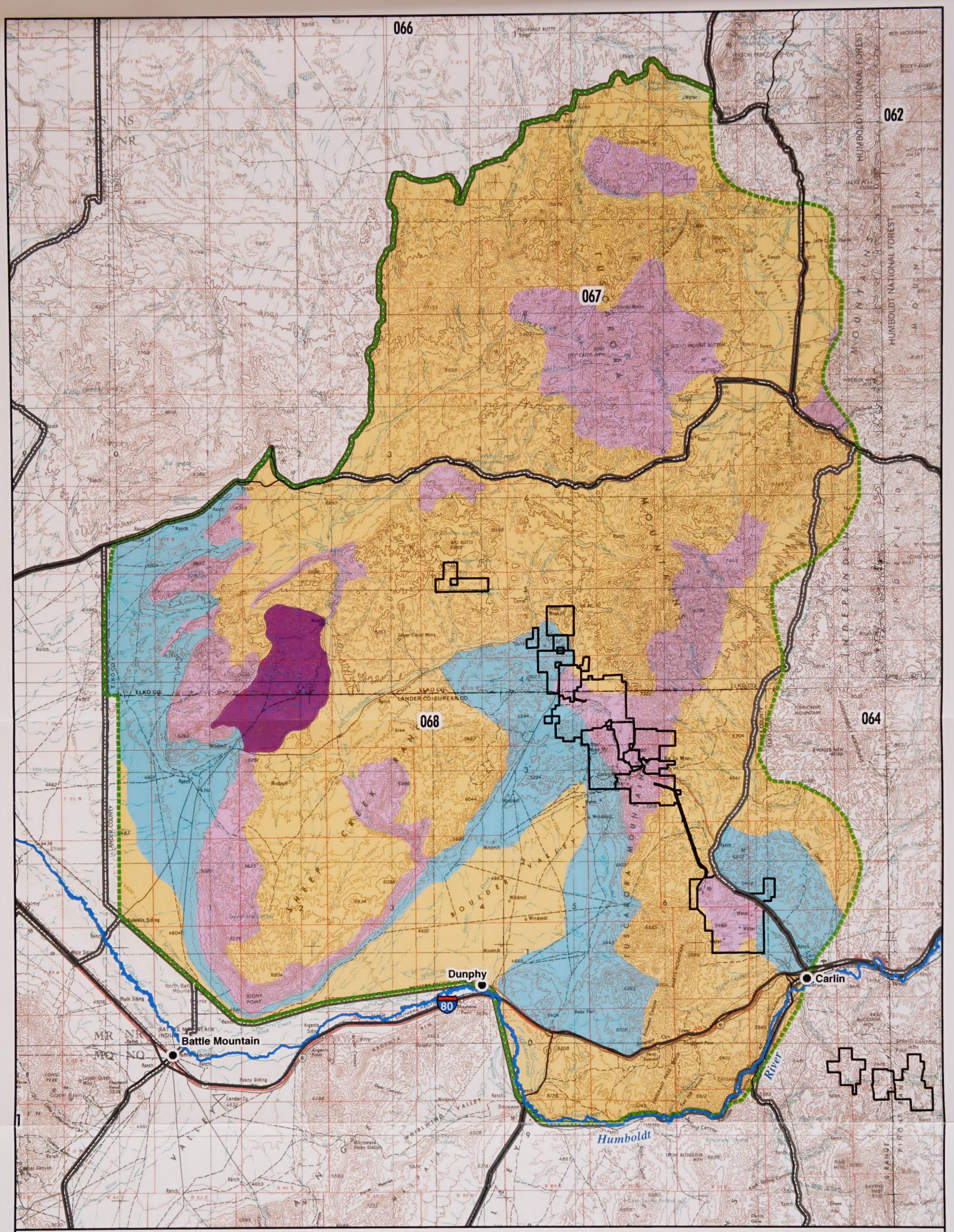


h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\revised_mdeer_051508.mxd

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

TERRESTRIAL WILDLIFE - MULE DEER HABITAT - CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-7



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N W E S

0 2.5 5 10

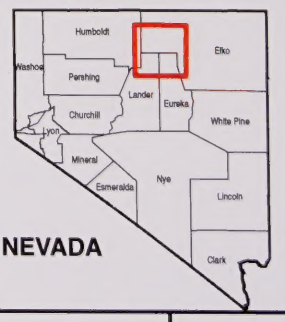
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Highway
- Plan Boundaries
- NDOW Unit Boundaries
- Pronghorn Antelope Cumulative Effects Study Area

Antelope Habitat

- All Year
- Crucial Winter
- Intermediate
- Summer
- Low Density
- Unidentified



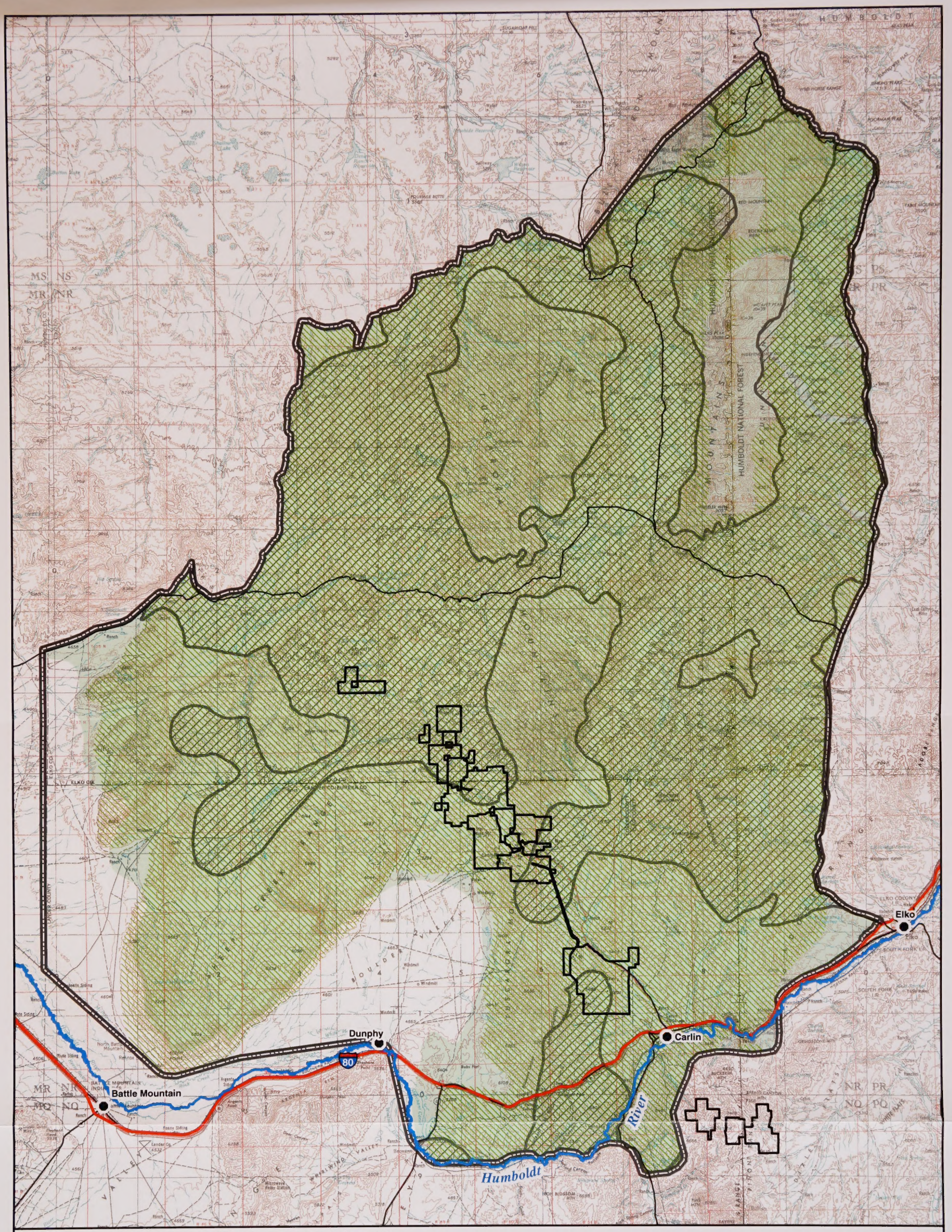
NEVADA

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

TERRESTRIAL WILDLIFE - PRONGHORN ANTELOPE HABITAT
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

3-8



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N
W E
S

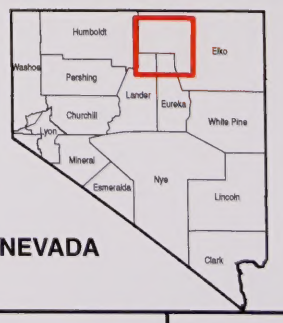
0 2.5 5 10
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Highway
- Plan Boundaries
- Cumulative Effects Study Area

Sage Grouse Habitat

- Winter Habitat
- Nesting and Early Brood Habitat
- Late Summer Habitat



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

SAGE GROUSE HABITAT
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-9

The Study Area for special-status species includes hydrographic basins that could be affected by mining in the Carlin Trend (**Figure 3-5**). This area encompasses habitat that would have potential to be affected by drawdown from mine dewatering and therefore, potentially impact species described below.

Yellow-billed Cuckoo (Candidate for Federal Listing)

The yellow-billed cuckoo in western North America has undergone decline in population due to losses and degradation of riparian woodland habitats resulting from conversion to agriculture, overgrazing, and competition from exotic plants (Wiggins 2005). This species is closely linked with riparian woodlands, but has not been documented in the Study Area. One dead cuckoo was found at Ruby Lake National Wildlife Refuge in 1972 and constitutes the only recorded cuckoo in Elko County.

Sage Grouse (BLM Sensitive species)

Greater sage grouse occur throughout the Study Area and are typically associated with sagebrush habitats in rolling hills and benches along drainages (BLM 2002a). Sage grouse habitat within the hydrographic basins that could be affected by mine development in the Carlin Trend is shown on **Figure 3-9**.

Pygmy Rabbit (Sensitive Species)

Pygmy rabbits are sagebrush obligates that prefer areas of relatively tall, dense sagebrush with deep soil suitable for excavating burrows. Sagebrush is the primary food of pygmy rabbits, but they also eat grasses and forbs depending on the seasonal availability. In Nevada, pygmy rabbits are generally found in sagebrush-dominated broad valley floors, stream banks, alluvial fans, and other areas with friable soil.

Other Sensitive Species

The following Sensitive Species and State of Nevada-Listed Species are reliant on water sources for direct life support and/or prey base:

- Preble's Shrew
- Swainson's Hawk
- White-faced Ibis*
- Black Tern
- Ferruginous Hawk
- Northern Goshawk
- Burrowing Owl
- Sensitive Bat Species (Spotted Bat, Townsend's Big-Eared Bat, Long-Legged Myotis, Western Long-Eared Myotis, Western Small-Footed Myotis, and Fringed Myotis)
- Loggerhead Shrike
- Nevada Viceroy.

* denotes State of Nevada-Listed Species

Details regarding the type of habitats and prey base for these species are described in the Leeville Project EIS (BLM 2002a) and SOAPA EIS (BLM 2002b).

MONITORING DATA AND NEW INFORMATION

Results of ongoing studies and monitoring efforts from 2002 to 2009 are summarized in this section. To date, mining and exploration operations in the Study Area have resulted in approximately 33,500 acres of surface disturbance of which approximately 1,920 acres have been reclaimed. Approximately 7,200 acres of additional disturbance are expected to occur from 2010 to 2020 in the Study Area (**Table 2-3**).

From 1999 through 2008 approximately 1.1 million acres of wildlife habitat have been affected by wildfire in the Study Area. About 52,000 acres of habitat lies within Plan boundaries for the various mine operations and

exploration projects as shown on **Figure 2-7**. Actual disturbance (mining and exploration) since initiation of mining operations in the Carlin Trend within the Plan boundaries is approximately 33,500 acres. The difference (18,500 acres) between the Plan boundaries (52,000 acres) and actual disturbance (33,500 acres) encompasses undisturbed land that may or may not be accessible to wildlife. Some mine components such as heap leach facilities, tailing storage facilities, and mill sites are fenced to preclude access by wildlife. Not all Plan boundaries are fenced at the present time (exploration Plan boundaries and the Bootstrap project site, for example) so wildlife continues to have access to these areas.

Tables 3-8 and **3-9** show the number of acres that have been impacted by mining and wildfire in the Study Area.

TABLE 3-8
Effects of Mining and Fire on Mule Deer and Pronghorn Habitat

Habitat	Area (acres)	Area Included in Plan Boundaries (acres)	Area Effected by Fire (acres)
Mule Deer			
Crucial Winter	386,589	1,097	267,057
Intermediate	544,078	11,030	295,201
Low Density Use	1,061,856	39,739	415,338
Summer	994,862	187	191,633
TOTAL	**2,987,385**	**52,053**	**1,169,229**[1]
% of Total		**1.7**	**39**
Pronghorn			
All Year	106	0	106
Crucial Winter	254,339	11,785	115,736
Intermediate	29,402	0	15,207
Low Density	247,344	28,988	109,473
Summer	1,059,524	11,280	508,942
Unidentified	2,556	0	1,287
TOTAL	**1,593,271**	**52,053**	**750,751**[1]
% of Total		**3.3**	**47**

[1] Includes Study Area for Terrestrial Wildlife and Special Status Species

TABLE 3-9
Percent of Mule Deer and Pronghorn Habitat Affected by Mining and Fire

Habitat	Mule Deer		Pronghorn	
	Mining	Fire	Mining	Fire
All Year	---	---	0.0	100
Crucial Winter	0.3	69.1	4.6	45.5
Intermediate	2.0	54.3	0.0	51.7
Low Density	3.7	39.1	11.7	44.3
Summer	0.02	19.3	1.1	48.0
Unidentified	---	---	0	50.4

From 1999 through 2008, wildfire has damaged 996,234 acres of sage grouse habitat in the Study Area (**Table 3-10**). Wildfire has also burned portions of the Study Area prior to 1999. Approximately 383,000 acres have been seeded or managed for natural release (natural revegetation) to rehabilitate burned areas (see Chapter 2 – *Wildfires and Reseeding).* Canopy cover in some areas has been reduced. Forb and grass diversity has also been reduced and recovery of these habitat types will vary in terms of time and cover across the burned areas (see *Vegetation* section in this Chapter).

CUMULATIVE EFFECTS

Cumulative effects on wildlife in the Study Area have resulted primarily from wildfires, mineral exploration, mining activities, non-native invasive weeds, livestock grazing, drought, urbanization, and seeding of native range with introduced herbaceous species. Other industrial development activities in the area such as a power plant, transmission lines, and roads also contribute impacts to wildlife.

TABLE 3-10
Acreage and Percent of Sage Grouse Habitats Affected by Mining and Wildfire

Habitat Type	Study Area Acres	Mining (%)	Wildfire (%)
All Sage Grouse[1]	2,090,035	32,689 (1.5%)	996,234 (47.6%)
Nesting/Brood Rearing	1,065,587	24,397 (22.9%)	455,725 (42.7%)

[1] Includes winter, nesting and early brood rearing, and late summer habitats.

Development of reasonably foreseeable mine projects and the Ruby Pipeline will continue to impact big game in the Study Area; however, mine areas proposed for development have been the site of human activity including exploration drilling and environmental monitoring programs or are within or adjacent to existing mine areas (Wilkinson 2007b). Wildlife has either moved from these areas or has become habituated to the activity and remains in the general area.

Wildfire and Mining

Within the Study Area, wildfire has created one of the primary cumulative effects on wildlife. Wildfire has resulted in the temporary to long-term loss of shrubs that provide forage and cover as habitat components, that has caused reductions in mule deer and antelope herds throughout the Study Area (see Chapter 2 – *Wildfires and Reseeding*).

Mining has removed approximately 52,000 acres of wildlife habitat as a function of fencing and/or land disturbance associated with mining operations. Mine dewatering programs could result in reduction or loss of flow in springs and seeps that support wildlife. Models predict that approximately 182 springs and seeps and associated wetlands may be affected by drawdown from mine dewatering (BLM 2000; HCltasca 2009). Reductions or elimination of flow in springs, seeps, and streams from dewatering could impact wildlife species dependent on these sites (e.g., amphibians, springsnails, and birds) and may affect distribution of other species (e.g., bats, mule deer and pronghorn antelope) that use these sites as part of a larger habitat complex (see *Water Quantity and Quality* and *Fisheries and Aquatic Resources* sections in this chapter). Mitigation programs implemented by mining operations include obligations to maintain or augment flow in springs and streams that are import to wildlife species.

Riparian habitat rehabilitation and stabilization programs implemented since 1993 have resulted in an increase in acres and health of riparian and wetland areas in the Study Area (see *Stabilization and Rehabilitation Programs* section of Chapter 2). Reseeding of areas burned by wildfires are described in the *Wildfires and Reseeding* section of Chapter 2.

Potential effects of dewatering on surface water features are described in the *Water Quantity and Quality* section of this Chapter. Habitat improvement resulting from various plans and programs implemented in the Study Area are described in Chapter 2 –*Stabilization and Rehabilitation Programs.*

Big Game

Mule Deer and Pronghorn Antelope

Mining activity in the Study Area occurs on less than 0.1 percent of mule deer summer range, approximately 2 percent of intermediate range, and 0.3 percent of crucial winter range. Mining disturbances have affected 1.1 percent of pronghorn summer range and approximately 4.6 percent of crucial winter range in the Study Area (**Table 3-9**). Migration corridors are specific areas within intermediate ranges which are based on, but not limited to factors such as vegetation type, topography, and elevation. While the overall percentage of affected habitat is small, maintaining mule deer migration corridors around and between the various existing and foreseeable mining projects is an issue of concern (Wilkinson 2007b).

Traditionally, mule deer migrated along both flanks of the Tuscarora Mountains to and from wintering areas. Little Boulder Valley served as an intermediate range staging area prior to migration. With the reduction in the quantity and quality of the mule deer intermediate range, mule deer currently tend to move through this habitat more rapidly, therefore, onto winter range earlier in the season (Lamp 2007). With decreased availability and use of the intermediate range in the Study Area, increased demand is placed on forage on winter range areas.

Most deer migrating from the northern summer range to Dunphy Hills move east of the Leeville Mine and then south. Mining actions have impacted historic migration corridors in the southern portion of the Tuscarora Mountains. This has effectively reduced an historic 10-mile wide area on the Tuscarora Mountains which provided mule deer intermediate range (spring, fall) and migration corridors to less than a 0.5-mile wide area near the Pete Project. Encumbrances to mule deer movements include mineral exploration, active mining operations, livestock control fences, the North-South Haul Road, and vehicular traffic to mine areas along State Route 766 (Simon Creek Road). NDOW with support from Newmont and Barrick has begun to collect monitoring data using radio collars to identify migration routes of mule deer in this area. One radio-collared mule deer doe migrated through the area in 2006 (Wilkinson 2007b). In 2007, two radio-collared deer wintered in the Dunphy Hills and migrated north through Sheep Creek passing between Leeville and the 4-2 Tailing Storage Facility and continued north into the Tuscarora Mountains. A third radio-collared deer wintered in Maggie Creek, north of Gold Quarry, and then migrated up Maggie Creek into a 2-year old burn area. One radio-collared deer passed through the Pete Project area during spring 2007 (Pettit 2008).

A study was initiated in December 2007 to determine seasonal mule deer movements within the Carlin Trend. The study included radio telemetry from collars placed on six deer, ground observations, and ten aerial surveys conducted between October 2008 and April 2009. Conclusions based on observations made during the short study period are limited. Deer

migrations in the Study Area are dependent on weather conditions, timing and depth of snow accumulation, and impacts of fire on cover and forage, especially fall forage (browse) and the nutritional quality of the spring forage (forbs).

Initial results of the study indicate that three corridors are used: Maggie Creek Corridor, East and West Flank of Tuscarora Range, and the Santa Reina. The Maggie Creek and Santa Reina corridors lie at the eastern and western edges of the Study Area. The East and West Flank corridors converge near Richmond Mountain. Development of the Carlin Mine, Pete Project, North-South Haul Road, and other projects in and around Little Boulder Valley has occurred within this corridor. The telemetry data indicates that deer continue to use this corridor (GBE 2009).

Based on observations made during the study period, mule deer are migrating to the winter range in Boulder Valley and Dunphy Hills (and beyond). It is not clear if the mining activity and wildfire related habitat removal have caused any shifts in this migration, but both of these factors create conditions that may alter deer movement.

Although one year of data does not allow for compelling conclusions, it appears that the entire width of the Study Area is being used for migration and deer adjust their movements to annual climatic conditions as well as changes on the landscape from wildfire and mining. In years like 2008 when fall migration is dispersed over time and space, the impacts of fires and mining appear to not be limiting factors to deer migration. However, in years when conditions require that the migration be direct and quick, the lack of cover and the need to find new pathways may create unsuitable conditions that are not easily negotiated (GBE 2009).

The Carlin Trend Mule Deer Working Group (consisting of representatives from Newmont, Barrick, NDOW, and BLM) has drafted a Mule Deer Habitat Management Plan for the Carlin Trend. Objectives of the group are to develop strategies that to the degree practicable provide the following:

- Maintain currently undisturbed migration corridors;
- Modify existing migration impediments to facilitate deer movement;
- Incorporate reclamation measures that reduce or eliminate impacts to migration corridors and habitat;
- Develop stable landform designs that complement surrounding topography and support mule deer habitat requirements;
- Enact fire management strategies to protect deer habitat, with an emphasis on crucial mule deer winter range, after each new fire;
- Rehabilitate burned areas as quickly as possible;
- Rehabilitate historic burns that do not currently provide adequate deer habitat; and,
- Ensure that there is sufficient forage and cover for mule deer.

Effects of wildfires to terrestrial wildlife species include loss of habitat (forage and cover) which can lead to die-offs of mule deer and pronghorn antelope as well as other species. Some native shrub communities have been replaced by cheatgrass-dominated grasslands.

Numbers of migrating mule deer are not well known because the herd has declined from 30,000 to about 8,000 animals due to effects of fire on winter ranges and the mild winter of 2006 which caused few mule deer to migrate (Lamp 2007). An emergency antlerless deer hunt was conducted in Area 6 during the 2006

hunting season. The purpose of this hunt was to reduce the deer population in response to the loss of crucial habitat destroyed by fires during the summer of 2006. A total of 1,116 permits were issued for this hunt and hunters harvested 646 animals.

Displacement of mule deer and pronghorn from wildfire, mining activities, and other land uses increases demands on adjacent habitats. Most habitats are at carrying capacities and can not support additional animals (Wilkinson 2007a). Displaced animals would be lost from the population until habitats are rehabilitated, restored, or mitigated, allowing population to expand into affected areas.

Pronghorn habitat in wildlife management Unit 067, 068, Western Elko and Northern Lander and Eureka counties, experienced range fires of over 500,000 acres during the summer of 2006 (NDOW 2007a). The Area 6 antelope herd was approximately 1,200 animals, but following the 2006 summer wildfires, NDOW (2007b) estimates that Area 6 can support 700 to 800 antelope.

Elk

Extensive fires in the Study Area have converted many shrub-dominated communities to grass-dominated communities. Elk, being primarily grazers, have benefited from increased grass production following fires; however, a multiple shrub component is needed for cover and forage diversity on a yearlong basis. Reclaimed areas on mine sites provide forage for elk because reclamation seed mixes have a large grass component, especially in early stages of reclamation. Mine perimeter fences may preclude use by elk until they are removed (Wilkinson 2007b).

Special Status Species

Fires have negatively impacted sagebrush-associated species' habitat in the short- to mid-term (5 to 15 years), due to loss of sagebrush canopy cover and vertical structure for nesting and cover. Diversity of forb and grass communities on cheatgrass dominated areas remains limited which also negatively impacts sagebrush obligates and associated species. Conversion of extensive areas of shrub steppe in the Study Area by fire to large expanses of burned area, dominated by exotic grass species, has reduced the prey base and foraging and nesting habitat for numerous sagebrush associated species. The *Wildfires and Reseeding* section of Chapter 2 provides a description of areas burned and reseeded in the Study Area. Seeding projects have reestablished forage for certain species; however, in some cases, reseeded areas have burned in later years after vegetation had become established.

If springs, seeps, or stream reaches become dry in response to mine dewatering activities, and associated vegetation is lost, potential nesting and foraging habitat would be reduced (see *Water Quantity and Quality* section in this chapter). To date, few springs have exhibited change in flow as a result of mine dewatering activities (see *Water Quantity and Quality* section in this chapter). Springs that have formed (Sand Dune, Knob, and Green) in Boulder Valley as a result of discharge of excess water from mine development have created additional riparian habitat that could benefit hawk and owl species due to increase in prey base supported by these springs. These springs will likely dry up after dewatering ceases.

Mine dewatering could potentially reduce available water and cause long-term effects to the riparian community within the Study Area, which could result in loss of breeding, foraging, and cover habitats; increased animal mortalities; reduction in overall biological diversity; possible genetic isolation; and possible long-term impacts to population numbers of some species. Recovery of groundwater and surface water would be gradual. Incremental habitat loss would affect big game, upland game birds, waterfowl, shorebirds, raptors, songbirds, non-

game mammals (e.g. bats), area reptiles, and amphibians. Implementation of programs to rehabilitate and stabilize riparian and wetland areas (see *Stabilization and Rehabilitation Programs* section in Chapter 2) has increased the size, function, and health of these areas.

Federally listed species or special-status species have not been identified in the TS Power Plant project area; therefore, no impacts are anticipated (ENSR 2004a). Sensitive species that may occur in the area include the pygmy rabbit, bat species, Swainson's hawk, ferruginous hawk, loggerhead shrike, long-billed curlew, western burrowing owl, Nevada viceroy, and the Columbia spotted frog.

Yellow-Billed Cuckoo (Candidate for Federal Listing)

Mine dewatering could potentially reduce available water and cause long-term effects to the riparian community within the Study Area, which could result in the loss of breeding, foraging, and cover habitats for the yellow-billed cuckoo. To date, losses of riparian habitat due to mine dewatering have been minor, associated with reduced flows in several springs. Overall, improvement of riparian habitat in the Maggie Creek and Willow Creek drainages associated with enhancement projects have resulted in a net increase in riparian habitat quality, which could potentially benefit the yellow-billed cuckoo.

Sage Grouse (BLM Sensitive Species)

The primary factor affecting sage grouse habitat in the Study Area is wildfire (**Table 3-10**). Impacts on sage grouse habitat from fire (48% loss of sagebrush habitat subject to temporary to long-term reduction in shrub cover), mining (1.5% loss of sagebrush habitat), and other disturbances have reduced habitat for sage grouse by nearly 50 percent in the Study Area (**Figures 2-4** and **3-9**). Habitat has been affected on a temporary to long-term basis by wildfires dependent, in part, on time of natural recovery of vegetation including sagebrush, and success of post-fire habitat rehabilitation including shrub, grass, and forb seeding. Livestock grazing is a factor that affects sage grouse habitat. Trampling of springs and wet meadows, by livestock reduces the quality and quantity of water and vegetation. The 2006 fires affected habitat for an estimated 10,000 sage grouse and approximately 117 sage grouse leks on the Elko District. Additional leks were affected by fires between 1999 and 2005 and fires as of July 2007 (Wilkinson 2007b). NDOW is in the process of determining the status of fire-affected and non-affected leks in Northeastern Nevada. In the Study Area, fires have burned 996,234 acres of sage grouse habitat (**Table 3-10**).

Mining, construction of roads, power lines, fences, and reservoirs have resulted in loss and fragmentation of sage grouse habitat. Mining companies, BLM, and NDOW have implemented programs to mitigate direct impacts to sage grouse populations and habitat due to mining activities, as well as provide off-site mitigation measures to address permanent impacts to sage grouse and associated sagebrush habitats affected by mining activities. Re-seeding of burned areas to establish sagebrush-grassland communities has been widespread in the Study Area (see *Wildfires and Reseeding* in Chapter 2). From 1999 through 2008, approximately 287,000 acres of previously burned sage grouse habitat was reseeded; however, the success of re-establishment of sagebrush and other plants important to sage grouse, on re-seeded areas, has not been comprehensively studied.

Potential loss of springs and seeps due to mine dewatering activities has the potential to reduce amounts of riparian habitat and water sources for sage grouse. Springs and riparian areas are important for brood rearing because of drinking

water, increased insect numbers, and succulent green vegetation, which are important food for sage grouse in summer. To date, few springs or seeps have been affected by mine dewatering activities. Mine operators in the Carlin Trend monitor springs and seeps throughout the Study Area. Conditions of these water sources are described in the *Water Quantity and Quality* section of this chapter. Mitigation programs implemented by mining operations include obligations to maintain or augment flow in springs that are import to wildlife species.

Pygmy Rabbit (Sensitive Species)

Currently, in the Study Area, there are about 2 million acres of sagebrush habitat, but not all of this would provide suitable habitat for pygmy rabbits. As discussed for sage grouse, loss of sage brush habitat from fire (48% loss of sagebrush habitat), mining (1.5% loss of sagebrush habitat), and other disturbances have reduced habitat for pygmy rabbits by approximately 50 percent in the Study Area.

Preble's Shrew (Sensitive Species)

Preble's shrews occupy a diversity of habitats including wetland and marshy habitats with emergent vegetation and woody species. Mine dewatering could cause springs to dry or become smaller, which could reduce potential habitat for Preble's shrew. Widespread wildfires have altered and would continue to alter habitat for this species.

Swainson's Hawk

Swainson's hawks are seasonal residents and nesters in the Study Area, migrating to South and Central America in winter (Ryser 1985). This hawk nests in clumps of trees, often in agricultural and riparian areas or near springs. Swainson's hawks feed mostly on large insects and small mammals; however, they will also take bats, birds, and amphibians. If springs dry and associated vegetation is lost, potential nesting habitat could be reduced.

Ferruginous Hawk

Ferruginous hawks nest in scattered juniper trees at the interface of the piñon-juniper zone and desert shrub communities overlooking broad open valleys (Herron *et al.* 1985). The ferruginous hawk preys mostly on rodents and rabbits but will also take birds and reptiles. Because ferruginous hawks often nest in low trees and shrubs, wild fires have probably reduced nesting habitat.

Ferruginous hawks concentrate in the wet meadows along upper Maggie Creek during summer and early fall. This area appears to be a staging area where the birds feed on large populations of small mammals prior to migration (BLM 2002b). Groundwater drawdown from mining activities could reduce amounts of water that support riparian vegetation and wet meadows in the upper Maggie Creek drainage, and reduce habitat quality for small mammals – prey of ferruginous hawks staging to migrate.

White-faced Ibis (Sensitive Species)

The white-faced ibis is a shorebird that nests in heavy emergent wetland vegetation. Wet meadows (950 acres) along Maggie, Coyote, and Little Jack creeks are potential nesting and foraging areas for this species. Groundwater drawdown from mining activities could reduce amounts of water that support riparian vegetation and wet meadows in the upper Maggie, Coyote, and Little Jack drainages and reduce habitat quality for nesting and foraging.

Black Tern (Sensitive Species)

Black terns typically nest in marshes and small ponds often on old muskrat houses, floating

mats of vegetation, or abandoned coot or grebe nests (Montana Natural Heritage Program 2007; Cornell Laboratory of Ornithology 2001). Water levels in most black tern breeding habitats are from 0.5 meters to 1.0 meter deep. Black tern habitat most likely occurs in the upper Maggie Creek drainage of the Study Area.

Impacts to existing or potential black tern nesting habitat could occur if groundwater drawdown from mine dewatering dries marshes or ponds or reduces recharge to breeding habitat associated with springs and stream flow.

Northern Goshawk (Sensitive Species)

Goshawks in the Study Area occupy shrub steppe habitat and usually nest within 100 yards of a spring or stream (BLM 2002a). Widespread wildfires may have affected foraging habitat for goshawk by converting shrub steppe habitats to grasslands dominated by annual grasses. The loss of shrub cover and density has probably reduced the prey base for many species associated with shrub habitats. If mine dewatering causes flow to decrease or stop in springs and seeps, potential nest sites could be affected.

Burrowing Owl (Sensitive Species)

The burrowing owl generally nests in abandoned rodent burrows in areas with low or desert vegetation. Widespread wildfires have altered diversity and structure of natural vegetation and converted many areas to stands of annual grass with few shrubs. Prey for burrowing owls (small mammals and insects) likely has been reduced by conversion of native communities to large expanses of burned area, dominated by exotic grass species.

The spadefoot toad is an important part of the burrowing owl's diet in parts of Nevada. If flows to springs and seeps decreases or stops as a result of mine dewatering potential breeding habitat for the spadefoot toad could be affected.

Loggerhead Shrike (Sensitive Species)

This species typically occupies open habitats where it perches on shrubs, trees, and other elevated structures. The shrike preys on small birds, insects, lizards, and small mammals. Conversion of extensive areas of shrub steppe in the Study Area by wildfire to large expanses of burned area, dominated by exotic grass species, has probably reduced the prey base and nesting habitat for this species.

Bats (Sensitive Species)

Wetlands and surface water associated with springs and seeps, sagebrush grasslands, juniper woodlands, and rocky outcrops in the Study Area provide habitat for sensitive bat species. Rock crevices may provide roosting habitat and marginal breeding habitat. Caves, abandoned mines, and abandoned buildings provide optimum habitat for roosting and breeding for colonies of bats. Water sources are critical to bats because they drink from open water and insects are more abundant around wetlands and open water. Studies in desert habitats have found that bat activity is 40 times greater near wetlands and riparian areas than in upland areas (Nevada Bat Working Group 2002). Even high-elevation tree-roosting bats fly to open water, wetlands, and riparian areas to drink and forage. Mine dewatering that reduces or eliminates flows from springs and seeps would adversely affect foraging habitat for bats. Based on the CIA report (BLM 2000), 182 springs potentially could be dewatered in the Study Area from mining activities.

Pit lakes are predicted to establish after mining is completed in the Gold Quarry, Betze/Post, and Tara pits. Water in these future pit lakes is predicted to contain varying concentrations of constituents that would be released from the exposed rocks in the pit walls (see *Water Quantity and Quality* section of this chapter). Pit lake water quality would be unique to each pit as the factors that influence water quality are

unique to each pit including but not limited to pit depth, water table elevation, inflow rate, period of time to fill to premining water table levels, oxygen content, pit shape, stratification of the water column, and geology.

Bats, water fowl, and other wildlife may be attracted to the pit lakes as a source of water and for prey. Given the range of pit water quality conditions that could occur comparing one pit to another and within pits over time, the potential effect of pit lake water quality on wildlife species would also vary (see *Water Quantity and Quality* section in this Chapter).

Nevada Viceroy (Sensitive Species)

This butterfly occurs in moist areas that provide habitat for willow and cottonwood, host species for the larvae. Loss of riparian habitat or springs and seeps, as a result of mine dewatering, would reduce potential habitat for this species.

Oil, Gas, and Geothermal

Potential development of fluid minerals (oil, gas, and geothermal) would result in creation of roads and land disturbance in areas where these surface activities do not currently exist. Introduction of human activity in remote areas would cause displacement of animals in response to road use. Plans for oil and gas development within the Study Area have not been submitted to the BLM as of the date of this document. Recent oil exploration activity includes two "dry" holes; one drilled in Section 34, Township 31 North, Range 51 East in February 2008, and one in Section 16, Township 34 North, Range 54 East, which was plugged in September 2009. Two tracts have been issued leases for geothermal.

TG Power LLC proposes to construct a geothermal power plant near the Spanish Ranch north of Tuscarora. An associated 120kV power line is proposed from this power plant to the Humboldt Substation north of Elko and will cross both public and private land.

Energy Development and Distribution

TS Power Plant

Operation of the TS Power plant may result in some displacement of big game species from the Study Area. Potential impacts to mule deer would be minor since the majority of the southern Boulder Valley is designated as limited range for mule deer (habitat occasionally inhabited and/or contains a small population of scattered animals). Pronghorn occur throughout the valley, but are most common near the irrigated fields in northern and central Boulder Valley (ENSR 2004a). The area is not important habitat for mule deer, pronghorn antelope, or elk; but these species, which may transient in the area, will be excluded from the power plant site by a security fence around the perimeter.

No federally listed species or special-status species have been identified in the TS Power Plant project area; therefore, no impacts are anticipated (ENSR 2004a). Sensitive species that may occur in the area include the pygmy rabbit, bat species, Swainson's hawk, ferruginous hawk, loggerhead shrike, long-billed curlew, western burrowing owl, the Nevada viceroy, and the Columbia spotted frog (ENSR 2004a).

Vegetation in the area of the TS Power Plant is greasewood dominated and does not have high habitat value for big game species or sage grouse. The project involved removal of a relatively small amount of habitat, primarily used by nesting birds and small animals.

Clearing, construction, and on-going maintenance of the transmission power line rights-of-way have resulted in habitat loss, habitat degradation, and displacement of wildlife. Temporary loss of sagebrush-grassland

would contribute to cumulative effects on mule deer, pronghorn, pygmy rabbits, raptors, sage grouse, songbirds, and small mammals. Natural revegetation and/or reclamation of disturbances within the new transmission corridor would change the species composition and densities of some wildlife species.

Water quality of the power plant cooling ponds is not expected to be hazardous to waterfowl or other wildlife. Power plant cooling ponds are fenced with a design specified by NDOW for artificial industrial ponds to prevent access by terrestrial wildlife. Additional measures (e.g., water balls, netting and hazing) may be required to prevent access by birds (ENSR 2004a).

Ruby Pipeline Project

The Ruby Pipeline Project would be constructed within a 115-foot wide construction corridor. Approximately 14 acres of sagebrush habitat would be disturbed per mile of pipeline construction. The additive effect of pipeline construction with other ongoing mining operations in the Study Area would continue a trend toward a reduction in sagebrush habitat/community types. The pipeline route would extend about 26 miles across the mule deer and pronghorn Study Area disturbing 358 acres of habitat. Construction would affect approximately 168 acres of mule deer habitat (112 acres of intermediate/56 acres crucial winter) and 112 acres of pronghorn crucial winter range. The remaining area for both species would be summer or low density range.

The pipeline would extend across about 60 miles of sage grouse habitat disturbing approximately 850 acres of winter and nesting/early brood rearing habitat.

Impacts to sagebrush dominated community types would be long-term due to the time required to reestablish the vegetation characteristics of these community types. The arid environment in this region is not conducive to plant growth, and regeneration of vegetation following construction would be slow.

Noise

Some noises generated by mining and exploration activity are sporadic, impulsive, and fluctuate in intensity and duration (e.g., blasting, drilling, rock dumping) (Bowles 1995). Wild animals tend to move away from disturbances which cause these sporadic noises. Other noises are constant (24 hours/day; 7 days/week; 300 + days/year) such as mill operations and sprinkler operations. Animals tend to habituate to noises where there is repeated exposure and they adapt behaviorally and physiologically (Bowles 1995).

Sage-grouse numbers on leks within one mile of a coal bed methane compressor station in Campbell County, Wyoming, were consistently lower than on leks not affected by this disturbance. Lek activity by sage-grouse decreased downwind of drilling activities, suggesting that noise had measurable negative impacts on sage-grouse (Braun 2006). One sage grouse lek is located within one mile of the Pete Mine in the Study Area.

Urbanization

Land development in the Study Area including subdivision and commercial properties, are described in the *Land Development* section of Chapter 2. Current development has, and will likely continue to, affect mule deer and antelope habitat in the vicinity of the town of Carlin (Wilkinson 2007b).

Fences

Fences have been constructed in the Study Area to enclose mine development, preclude grazing on burned areas, and as a result of other land

development activities such as subdivisions, commercial/industrial facilities, and public rights-of-way. Fences can impede wildlife migrations especially during winter and early spring when deer are in a weakened condition. New fences on BLM land and at mine sites are constructed to facilitate wildlife movement and implement standard operating procedures to minimize conflicts to wildlife. Modifications of existing fences by BLM and NDOW to facilitate movement of big game are ongoing in the Study Area.

Non-native, Invasive Weeds

Cumulative effects on wildlife from invasive, non-native species include displacement of riparian/wetland habitat and native vegetation vital to wildlife. Further discussion of infestations and treatment programs on-going in the Study Area is contained in the *Vegetation Resources* section of this chapter.

Livestock Grazing

Grazing practices in the Study Area have improved over the past 20 years, notably within the Dunphy Hills area and the Izzenhood Range (NDOW 2007a); however, grazing in some locations continues to have a negative impact on winter habitat and intermediate range, particularly on kochia and bitterbrush (NDOW 2007a). Continuation of reasonably foreseeable livestock grazing in the Study Area will affect wildlife and wildlife habitat with the extent of impact depending on intensity and duration of grazing on public and private land. Ongoing efforts to properly manage livestock grazing in the Study Area have demonstrated that livestock grazing and healthy riparian areas are compatible. For example, stream and riparian area restoration projects including the Maggie Creek Watershed Restoration Program, Upper Willow Creek Restoration Program, and projects on the TS Ranch have resulted in improvement and expansion of riparian and wetland habitat in the Study Area.

RIPARIAN AREAS AND WETLANDS

This Final SEIS provides new quantitative data collected between 2002 and 2008 to further characterize cumulative effects to riparian areas and wetland resources previously described in SOAP EIS (BLM 1993) and SOAPA EIS (BLM 2002b).

Thirteen vegetation types were previously identified along tributaries to the Humboldt River within the Study Area (BLM 2002b). A total of 4,530 acres of riparian/wetland habitat occur within the Study Area; including 2,218 acres in Maggie Creek, 1,685 acres in Rock Creek (including Boulder Flat), 228 acres in Susie Creek, 388 acres in Humboldt River watersheds, and 10 acres associated with small tributaries to the Humboldt River. Approximately 193 acres of riparian habitat have been added in the Maggie Creek Basin as a result of restoration activities (Open Range Consulting 2007).

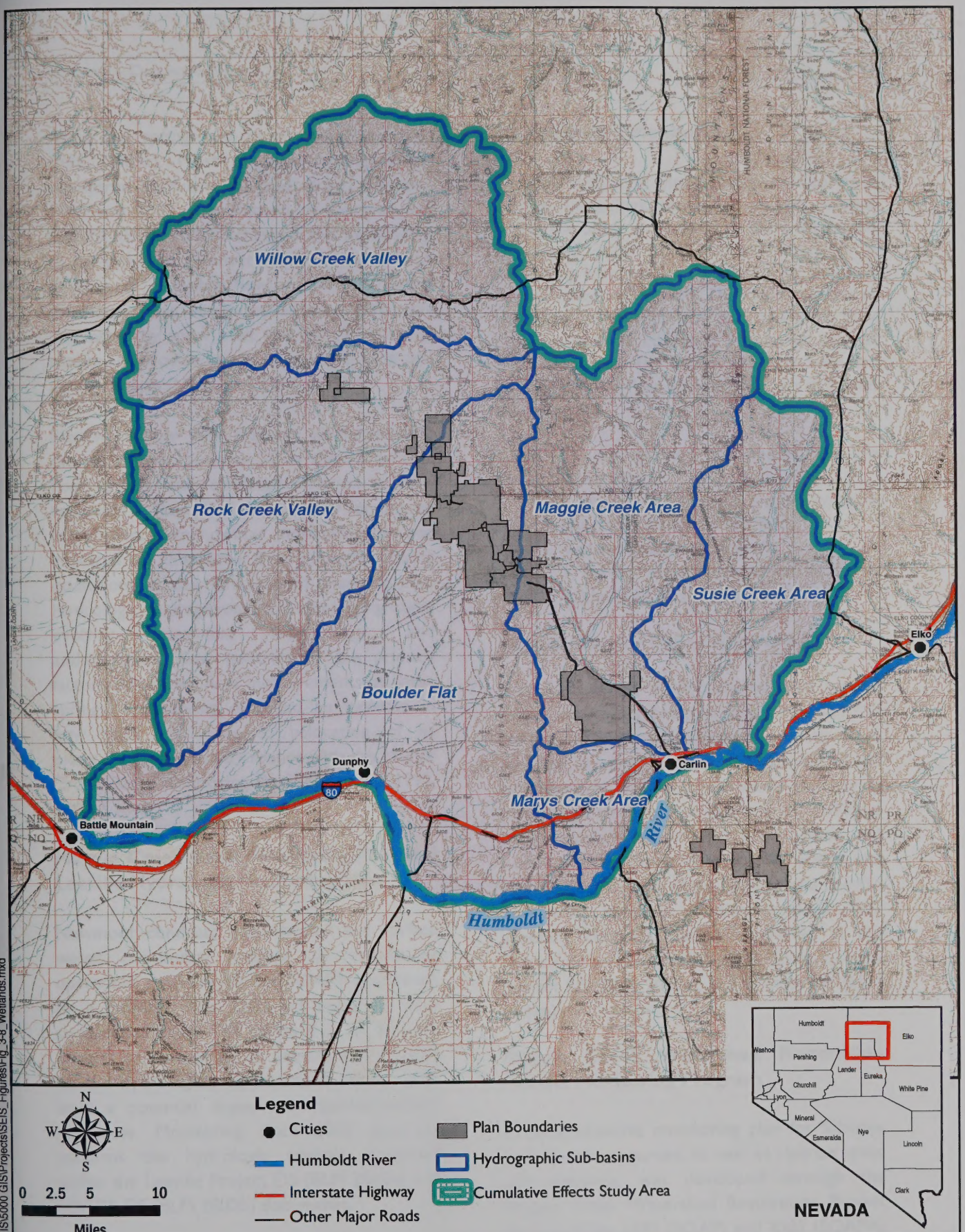
CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for riparian and wetland resources is located in the Humboldt River basin encompassing the following hydrographic areas: Susie Creek, Maggie Creek, Marys Creek, Boulder Flat, Rock Creek Valley, Willow Creek Valley, and the adjoining portion of the Humboldt River (**Figure 3-10**). The Study Area encompasses riparian and wetland areas that could be affected by groundwater drawdown associated with mine pit dewatering.

MONITORING DATA AND NEW INFORMATION

Newmont Spring Monitoring

In the fall of 1990, 182 springs were identified in the Study Area that could be affected by mine dewatering (BLM 2000). Currently, 33 of these



h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig_3-8_Wetlands.mxd

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

RIPARIAN AREAS AND WETLANDS
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

3-10

seeps and springs are monitored (Newmont 1992, 2009c). Most of these springs were monitored biannually (fall and spring) between 1990 and 2002. The Record of Decision for SOAPA (BLM 2002b) changed the monitoring to fall only and removed many of the springs because of negligible flow in the fall. Spring monitoring was eliminated because flow was dominated by snow melt and rain. Monitoring results are provided to BLM in annual seep and spring reports (Newmont 1992, 2009c).

Review of flow data indicates no measurable change in flow rates for 28 of the 33 springs. Four springs have exhibited variation in flow, reduction in flow, or have gone dry for one or more years. Groundwater monitoring has not indicated any drawdown from mine dewatering operations in the direction of these springs. Hydrologic investigations have identified grazing, evolving streambed morphology, and anthropogenic flow controls as the primary factors influencing flow measurements at these springs. One spring exhibited an increase in flow since 2001 due to relocation of its monitoring point in accordance with the Maggie Creek Basin Monitoring Plan (Newmont 1992, 2009c).

Maggie Creek Basin Monitoring Plan and Leeville Hydrologic Monitoring Plan

Newmont conducts groundwater and surface water monitoring related to dewatering operations at its Leeville and SOAPA operations on a monthly basis. Data are reported on a semi-annual basis. The purpose is to evaluate impacts of dewatering at Leeville and SOAPA on the hydrological environment, which could have a potential impact on riparian/wetland resources. Monitoring since 2002 generally confirms the hydrologic analysis contained within the Leeville Project EIS (BLM 2002a) and SOAPA EIS (BLM 2002b) documents.

Barrick Spring Monitoring

Barrick's mitigation plan includes monitoring a number of springs, seeps and stream reaches within the Study Area (AATA 2009). Under an agreement with BLM, Barrick conducts a continuing seep and spring monitoring program that commenced in 1989. The study consists of evaluating water chemistry and measuring flow rates, as well as collecting vegetation data at designated sites. The Betze/Post Mine Seep and Spring Study 20 Year Summary Report indicated the following:

- 29 springs had no impact due to dewatering;
- 1 site shows changes in water chemistry but not in discharge volume;
- 4 sites consistently dry; and
- 1 spring shows decreased discharge volume (AATA 2009).

Barrick Boulder Valley Monitoring

Barrick conducts a groundwater and surface water monitoring program that addresses "all aspects of potential impacts resulting from pumping of water including dewatering of the pit" (Barrick 1990). Surface water monitoring (hydrologic and water chemistry) is conducted on Antelope, Bell, Boulder, Brush, Rock and Rodeo creeks. Some of these fall within the possible impact area of the SOAPA and Leeville dewatering activities. Monitoring since 2002 generally confirms analysis contained in the Barrick Betze Project SEIS (BLM 2003), Leeville Project EIS (BLM 2002a), and SOAPA EIS (BLM 2002b).

Maggie Creek Watershed Restoration Project Monitoring Program

A comprehensive monitoring plan for fisheries and aquatic resources, as well as riparian areas and wetlands, was developed through the Maggie Creek Watershed Restoration Project as part of the 1993 (SOAP) and 2002 (SOAPA) mitigation plans. Detailed stream and riparian

habitat monitoring, as well as evaluation of prescriptive livestock grazing practices, has been conducted by BLM, Newmont, and other partners at regular intervals since 1994.

Studies by Open Range Consulting (2007) show an increase of 193 acres in wetland riparian acres and an increase of 1.8 miles stream length (due to increase in stream sinuosity) along Maggie Creek between 1994 and 2006. Sediment loading in Maggie Creek has reduced from more than 8,000 tons/day of sediment (as total suspended solids - TSS) during high flows in 1993 to a sediment load of less than 1,000 tons/day (as TSS) during similar flow in 2005 (Newmont 2009b). Increases in woody riparian vegetation overhanging the water column, pool quality, and depth at the shore-water interface on Coyote, Little Jack, and Maggie creeks have improved habitat quality for fish and many species of wildlife (Trout Unlimited 2007a).

Barrick Upper Willow Creek Habitat Enhancement Plan Monitoring Program

A monitoring plan for riparian areas and wetlands was developed as part of the Upper Willow Creek Habitat Enhancement Plan (BLM 2003). BLM and private consultants have been monitoring riparian conditions and water temperatures since 2001 at designated locations. In addition, Trout Unlimited, monitors fish populations in streams (see *Fisheries and Aquatic Resources* section in this chapter). Upland habitat monitoring at several designated locations has also been on-going.

The Upper Willow Creek Habitat Enhancement Plan has resulted in watershed improvements for numerous terrestrial and aquatic organisms in riparian and steam habitats in the Willow/Rock Creek drainage (CCA 2004). Extent and condition of riparian areas has increased or improved since initiation of the project (CCA 2004; BLM 2006b; Open Range Consulting, Inc. 2007).

BLM Riparian Monitoring

Functioning condition surveys of lentic (standing water) riparian habitats have been completed by BLM on allotments within the Study Area since 2003 (**Table 3-11**). Seventy percent of inventoried seeps and springs were either nonfunctional or found to be functioning at-risk, with a downward or non-apparent trend. Overuse of riparian vegetation by livestock was identified as the primary cause of poor conditions. Although prescriptive grazing protocols have been employed in portions of the Study Area, many of the lentic functioning condition surveys occurred in allotments or parts of allotments receiving hot season grazing on an annual basis. In some cases (notably Squaw Valley Allotment) recent changes in grazing practices are improving conditions over the allotment as a whole.

BLM has completed monitoring on streams affected by recent wildfires in the Study Area (BLM 2005b, 2006c, 2006d). Healthy riparian areas have either not burned or have recovered rapidly following fire. In wet years such as 2006, high plant moisture content resulted in riparian corridors remaining mostly intact. Some riparian areas were scorched during 2001, but regeneration of burned riparian vegetation has been good. Where riparian habitat conditions were poor prior to the fire, effects have been more long-term and have included channel down-cutting with potential loss of associated wetland plant communities.

CUMULATIVE EFFECTS

Mining operations, industrial development, and agricultural activities in the Study Area are expected to interactively affect regional riparian areas and wetlands. Potential cumulative impacts to these resources would include degradation of riparian and wetland habitat from livestock grazing, mining (surface disturbance and dewatering activity), conversion of native

riparian/wetland plant communities to communities dominated by invasive non-native species, other industrial development (e.g., power plants and transmission corridors), service roads, wildfire, and in some cases agricultural diversions. Riparian/wetland vegetation could be lost, either on a temporary or permanent basis. Currently, potential for impacts to riparian/wetland resources are associated with establishment of invasive non-native species (weeds) and with annual hot season grazing by livestock (where it occurs) resulting in loss of habitat and decrease/loss of vegetation.

With the exception of some localized impacts (reduced flow in Maggie Creek narrows and drying of three springs), dewatering impacts to approximately 618 acres of riparian and wetland habitats identified in previous EIS documents have not materialized. Improvement and expansion of riparian/wetland habitat has occurred in response to the Maggie Creek Watershed Restoration Project and Upper Willow Creek Habitat Enhancement Plan (Evans 2007).

TABLE 3-11
Summary of Functioning Condition Surveys for Lentic Riparian Areas

Allotment[1]	Total No. Sites Evaluated	Rating (No. Sites)[2]				
		PFC	FARU	FARN	FARD	NF
2005						
Blue Basin	37	8	1	4	19	5
Carlin Field	2	2	-	-	-	-
Hadley	3	1	-	-	2	-
Lone Mountain	19	6	3	2	6	2
T Lazy S	25	8	3	1	8	5
Twenty-five	40	11	2	3	16	8
2004						
Squaw Valley	58	1	11	0	37	9
2003						
Tuscarora	45	7	4	6	7	21
Totals (%)	**229**	**44 (19)**	**24 (10)**	**16 (7)**	**95 (41)**	**50 (22)**

[1]Allotments within the Study Area for Wetlands and Riparian Areas.
[2]Ratings: PFC=Proper Functioning Condition; FARU=Functional-at-Risk, Upward Trend; FARN=Functional-at-Risk, Trend Not Apparent; FARD=Functional-at-Risk, Trend Downward; NF=NonFunctional.
Source: Prichard *et al.* 1999 (2003).

Infiltration of excess mine water from dewatering operations has resulted in an increase in water levels, or mounding, south of Maggie Creek Reservoir (BLM 2002b), lower Maggie Creek, and upper Boulder Valley (BLM 2000). Mounding in the Maggie Creek area is likely due to seepage from the Maggie Creek Reservoir; reduced pumping from the Carlin Formation near SOAPA; and recharge along Maggie Creek as a result of mine dewatering discharge and irrigation.

In 1992-1993, seepage from the TS Ranch Reservoir resulted in the formation of three new springs (Sand Dune, Knob and Green Springs) in the northeastern portion of Boulder

Flat approximately 5 miles south the of the TS Ranch Reservoir (BLM 2000). Extensive stands of riparian and wetlands vegetation has developed with formation of these springs, resulting in approximately 1,200 acres of habitat. The combined flow from these springs is about 6,000 gallons per minute (Listerud 2007). This flow and associated riparian and wetlands habitats will continue as long as water from mine dewatering is placed in the subsurface near the TS Reservoir. Eventually, these springs will disappear once discharge to the TS Ranch Reservoir is discontinued. Cessation of flow would result in a loss of the established riparian and wetland vegetation, as well as associated aquatic organisms. The spring areas would revert to pre-discharge conditions and would again support upland vegetation species.

Recalibration of the numerical groundwater flow model (HCltasca 2009) indicates that impacts to riparian vegetation and aquatic habitats along the Humboldt River from base-flow reductions following cessation of pumping are less than projected in SOAPA (BLM 2002b) and CIA (BLM 2000). See *Water Quality and Quantity* section in this chapter.

Recent fires have affected some riparian and wetland habitats in the Study Area, many of these areas did not burn or have shown recovery in years following fires. Condition of riparian areas prior to wildfire represents the single most important influence in predicting effects of fire (Evans 2007). Many stream and riparian habitats burned by recent wildfires in the Study Area that are being managed under prescriptive livestock grazing programs continue to improve.

Potential effects of future wildfire on riparian areas and wetlands are dependent on site conditions at the time of a fire. Wetland and riparian areas that have retained sufficient moisture would likely survive wildfire with minimal loss of vegetation and aquatic life. Sites that enter the fire season in a dry state or are in poor ecological condition are more likely to be damaged by fire.

Previous predictions of higher loading of sediment due to mining activities, which could adversely affect wetlands in the Humboldt River, Humboldt Sink, and Wildlife Management Area 6 have not been documented. Sediment loading in Maggie Creek has been shown to be reduced during high flows in response to development of a healthy and well established riparian zone (see discussion of Maggie Creek Watershed Restoration Project in this section).

Quality of mine discharges is in compliance with permit limits, with no documented adverse impacts on receiving water including the Humboldt River (see *Water Quantity and Quality* section in this chapter). This supports the prediction that current and reasonably foreseeable mine discharges would not impact water quality and associated riparian/wetland resources in the Humboldt River.

Flooding in 2005 and 2006 throughout the Study Area resulted in erosion of some streams. Flooding impacts appeared to be moderated along portions of the Maggie Creek and Willow Creek drainages as a result of habitat restoration and re-vegetation efforts of the Maggie Creek Watershed Restoration Project and Upper Willow Creek Habitat Enhancement Plan (Evans 2007).

Grazing has affected and will continue to affect riparian areas to varying degrees. Depending on the level of management, livestock grazing may have minimal to extensive impacts on riparian management. Over the last several decades, riparian areas have generally improved throughout portions of the Study Area. As the need and opportunity for management changes are identified and implemented, riparian areas are expected to continue to improve. All

allotments within the Study Area are scheduled for 10-year grazing permit renewals which include environmental analysis of impacts to riparian areas from livestock grazing.

The TS Power Plant, located in the lower Boulder Valley, does not have any discharges to area streams, including the nearby Humboldt River. In addition, no wetlands or riparian areas are located in the project area. No impacts to riparian/wetland vegetation are expected and, therefore, the power plant project would not contribute impacts to riparian and wetlands in the Study Area.

FISHERIES AND AQUATIC RESOURCES (Including Threatened, Endangered, and Candidate Species)

This Final SEIS provides new quantitative data collected between 2002 and 2009 to further characterize cumulative effects to fisheries and aquatic resources previously described in the Leeville EIS (2002a), SOAP EIS (BLM 1993), and SOAPA EIS (BLM 2002b).

Fish species found in streams in the Study Area include Lahontan speckled dace, Lahontan redside shiner, Tahoe and mountain suckers, and Lahontan cutthroat trout (BLM 2000). In 2006 and 2007, smallmouth bass were documented in Lower Maggie Creek (MFG, Inc. 2006; Evans 2007). According to BLM Elko District Office stream survey files, the lower reaches of Rock Creek support non-native warm water fish species and bullfrogs (Evans 2007). With the exception of the Lahontan cutthroat trout, no other trout species (including non-natives) have been found within the Maggie Creek sub-basin (Elliott 2004). Brook trout were found in Spring Creek in 1992, but none were found during a 1997 survey of the stream (BLM 2002b). Brook and rainbow trout were previously stocked in Willow Creek, Rock Creek, Nelson Creek, and Willow Creek Reservoir; but none had been found in recent surveys as reported in 2004 (Elliott 2004).

The Humboldt River is considered a warm water fishery with species tolerant of high sediment load and warm water temperatures. Twenty-three species, including many which are introduced, have been recorded for the Humboldt River. In addition to common native minnow and sucker species found in headwater streams, the Humboldt River also supports the Lahontan tui chub (BLM 2003).

In 2006, a population of bullfrogs was identified in the lower reaches of Susie Creek (Evans 2007), although none were known to occur in this stream prior to then. A single bullfrog was also reported about 10 to 15 miles upstream of this location (Warren 2006).

Currently there are four species that are federally threatened, candidate or BLM-sensitive (fish, amphibians, and invertebrates) that reportedly occur within the Study Area:

- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) - federally listed (threatened) species;
- California floater (*Anodonta californiensis*) – BLM-sensitive species;
- Columbia spotted frog (*Rana luteiventris*) – federal-candidate species; and
- Springsnails (*Pyrgulopsis sp.*) – some species are BLM-sensitive; others have importance because of limited occurrence and/or potential for future listing.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for fisheries and aquatic resources encompasses a portion of the Humboldt River basin including the following hydrographic areas: Susie Creek,

Maggie Creek, Marys Creek, Boulder Flat, Rock Creek Valley, Willow Creek Valley, and the adjoining portion of the Humboldt River (**Figure 3-10**). This Study Area encompasses riparian areas and wetlands, as well as streams that could be affected by groundwater drawdown associated with mine pit dewatering.

MONITORING DATA AND NEW INFORMATION

Information collected as part of the following programs and projects is relevant to fisheries and aquatic resources and is summarized in the *Riparian Areas and Wetlands* section of this chapter:

- Newmont Spring Monitoring;
- Maggie Creek Basin Monitoring Plan;
- Barrick Spring Monitoring;
- Barrick Boulder Valley Monitoring;
- Maggie Creek Watershed Restoration Project (including Monitoring Program); and
- Barrick Upper Willow Creek Habitat Enhancement Plan (including Monitoring Program).

Additional programs, studies and monitoring efforts provide current information specific to fisheries and aquatic resources within the Study Area. These sources of information are summarized below.

Trout Unlimited Strategies for Restoring Native Trout Program – Maggie and Willow Rock Creek Drainages

A description of Trout Unlimited Strategies for Restoring Native Trout Program is contained in the *Stabilization and Rehabilitation Programs* section of Chapter 2. Results of Lahontan cutthroat trout monitoring in Maggie Creek watershed have shown fluctuations in Lahontan cutthroat trout populations since 2001, which are likely due to a combination of environmental and treatment influences (Neville and DeGraaf 2006). Poor recruitment in Beaver Creek in 2002 was likely due to a large fire in 2001 that affected riparian habitat allowing increased amounts of sediment to enter the stream. The population rebounded in 2003, but was exposed to a drought in 2004 when the population again declined. An abundance of water in 2005 and 2006 likely provided sufficient flow that Lahontan cutthroat trout were able to pass old culvert "barriers" still in place during spring 2005, allowing them to reach Beaver Creek to spawn. Presence of multiple age classes and higher numbers of Lahontan cutthroat trout in 2006, after culvert replacement in fall 2005, may indicate positive population responses to a combination of the culvert barrier removal and increased water flow. Additional post-barrier removal data are needed to detect a true trend in response to improved connectivity (Neville and DeGraaf 2006).

The Lahontan cutthroat trout population of Coyote Creek showed a decline during the 2004 drought from previously healthy numbers. Population of trout slowly rebounded in 2005 and remained stable in 2006 (Neville and DeGraaf 2006). Higher flows in 2006 caused erosion of upper elevation stream banks during spring runoff, resulting in increased amounts of sediment load in the creek. The increased sediment loading may have had negative impacts on spring spawning and may explain the absence of noticeable increases in Lahontan cutthroat trout numbers despite high water flow. Little Jack Creek may have also had negative effects due to drought conditions in 2003, but improved water conditions in 2005 and 2006 resulted in a higher number of Lahontan cutthroat trout surveyed along with higher pulses of young-of-year.

The Lahontan cutthroat trout population numbers in the Willow/Rock Creek watershed have been steadily increasing as the upper elevation habitat has been improving (Neville and DeGraaf 2006). Multiple classes of Lahontan cutthroat trout were present in 2005 and 2006, suggesting a natural reproducing population exists. Age class structure in the Study Area is mirroring that in the Frazier Creek control site, suggesting that habitat improvements in Willow Creek are affecting recruitment (defined as a measure of the number of fish that enter a class during some time period, such as the spawning class or fishing-size class). Multiple years of data are needed to detect a trend in response to on-going restoration efforts.

Benthic macroinvertebrates were sampled at six survey reaches in 2003 in Willow, Nelson, and Lewis creeks (Neville and DeGraaf 2006). Most reaches were dominated by the *Chironomidae* family (*Diptera* – flies), although one reach was dominated by the *Caenidae* family (*Ephemeroptera* – mayflies). Results of the survey indicated that Willow, Nelson, and Lewis creeks contained water with poor to marginal water quality (based on assessment of taxa richness and abundance of insect orders considered sensitive to pollution). Few taxa collected in upper Willow Creek basin were considered intolerant forms (resistant to pollution), indicating relative poor water quality. Willow, Nelson, and Lewis creeks also had slight to moderate organic enrichment.

Analyses performed on Lahontan cutthroat trout from Coyote Creek and Little Jack Creek indicated the organisms were pure. Genetic evaluations on four (Frazier Creek, Nelson Creek, Upper Rock Creek, and Toe Jam Creek) of the six Lahontan cutthroat trout recovery populations in the Rock Creek sub-basin indicated that no evidence of hybridization has been found (Elliott 2004). Trout Unlimited contracted with the Conservation Genetics of the University of Nevada-Reno in 2003 to examine population dynamics in the Maggie Creek Basin (Trout Unlimited 2007a). Results of the testing indicated that the Maggie Creek sub-basin (Beaver, Little Jack, and Coyote creeks) currently supports three distinct populations of Lahontan cutthroat trout.

Open Range Consulting - Evaluation of Factors Affecting Lahontan Cutthroat Trout in Three Large Watersheds

A description of this project is contained in the *Stabilization and Rehabilitation Programs* section of Chapter 2. Preliminary results indicate both upland and riparian plant cover has increased between 2003 and 2006. Correspondingly, percent bare ground in the watershed has deceased, while habitat for fisheries and aquatic resources has improved (Open Range Consultants, Inc. 2007).

Humboldt River Baseline Studies

As part of its NPDES Permit issued by NDEP, Barrick has conducted monitoring on the Humboldt River from 1995 to 2006. Barrick began discharging to the Humboldt River in late September 1997 and discontinued discharging in February 1999. Monitoring focused on the river's physical characteristics, aquatic habitat, mcaroinvertebrate communities, and to a limited extent, the fish communities in the Study Area (JBR 2007). The data essentially serve as baseline in the event Barrick were to resume discharge to the Humboldt River.

Effects of mine dewatering discharges on Humboldt River biota from the Gold Quarry, Lone Tree, and Betze mines were also evaluated by the USFWS (Wiemeyer *et al.* 2004). Besides serving as a baseline, the study concluded that there is no evidence that mine discharges have had adverse effects on biological resources in the Humboldt River.

BLM Stream Habitat Monitoring

Surveys conducted by BLM between 2000 and 2006 on streams within the Study Area show habitat conditions in response to improved livestock management practices (**Table 3-12**) (Elko District Office files). With the exception of Marys Creek (which is nonfunctional) and James Creek (which was rated non-functional in 2000), functioning condition studies done in conjunction with stream survey show streams are in proper functioning condition or are functioning-at-risk, with an upward trend (Pritchard *et al.* 1998). Flooding in 2005 and 2006 caused widespread impacts including erosion and deposition; however, streams that were in good condition prior to the flooding were less impacted and are recovering more quickly.

BLM Wildfire Impact Studies

As a result of the fires in 2006, BLM prepared an evaluation of fire impacts to special status species for the Elko Fire Management Plan Amendment issued by the USFWS in December 2003 (BLM 2006d). Information provided in this evaluation addresses monitoring activities and summary of observed impacts.

TABLE 3-12
Summary of BLM Stream Surveys in the Study Area between 2000 and 2006.

Stream	Year of Survey	Condition/Trend[1]	Riparian Grazing System
Maggie Creek Subbasin (Maggie Creek Area Hydrographic Basin)			
James Creek	2005	Poor/unknown	No (exclosure on part)
Indian Jack Creek	2005	Poor/up (flood damage)	Yes
Maggie Creek**	2006	Good/up	Yes
Coyote Creek**	2006	Excellent/up (localized flood damage)	Yes
Little Jack Creek**	2006	Excellent/up (localized flood damage)	Yes
Beaver Creek drainage (includes tributaries)**	20000	Excellent/up (areas of flood damage)	Yes
Susie Creek	2003	Good/up	Yes
Rock/Willow Creek Subbasin (Willow Creek Valley Hyrdrographic Basin)			
Frazer Creek **	2003	Excellent/up (localized flood damage)	Yes
Trout Creek	2003	Fair/up	Yes
Toe Jam Creek**	2003	Fair/up	Yes
Upper Willow(*) **	2002	Poor/up	Yes
Lewis Creek(*) **	2002	Good/up	Yes
Nelson Creek(*) **	2002	Good-Excellent/up	Yes
Rock Creek Valley Hydrographic Basin			
Middle Rock Creek	2003	Fair/up	Yes
Lower Rock Creek	2004	Fair/up –flood damage	Yes
Marys Creek Hydrographic Basin			
Marys Creek	2005	Poor – down – severe flood damage	No

[1]Condition rating based on an average of bank cover and bank stability in relation to optimum (optimum is considered totally stable streambank densely vegetated by trees or tall shrubs).

(*) Surveys conducted more recently by Cedar Creek Associates show continued improvement, especially on Upper Willow Creek.

** Lahontan cutthroat trout stream

Note: Spotted frogs in Maggie, Upper Willow, Susie, Coyote, and Little Jack creeks, California floaters in Maggie, Middle and Lower Rock creeks.

A number of drainages occupied by the Lahontan cutthroat trout, a federally listed species, and spotted frogs, a candidate species for listing, were burned in 2006 (BLM 2006d). In most cases, uplands were scorched, but riparian zones were green at the time of the fires and remained intact. Approximately 12 miles of occupied Lahontan cutthroat trout habitat and approximately 59 miles (includes some areas outside the Study Area) of potential Lahontan cutthroat trout habitat were affected by the 2006 fire (BLM 2006d). Occupied and streams potentially affected in the Study Area included Susie, Frazer, Upper Rock, Lone Mountain and Trout creeks. Spotted frogs occur in Susie Creek. Documented loss of Lahontan cutthroat trout, or spotted frogs, as a result or indirect effects of the 2006 fires was not recorded.

The Coyote and Buffalo fires in 2001 and the Esmeralda Fire in 2005 also affected occupied Lahontan cutthroat trout and spotted frog habitat. Both the Frazer and Beaver creek drainages were burned during 2001; while only portions of the riparian zone along Upper Willow Creek burned in 2005. Both Frazer and Beaver creeks were in good condition at the time of the fire and have recovered (BLM 2005b, 2006c).

In addition, Trout Unlimited (2007a) conducted population monitoring on Lahontan cutthroat trout streams affected by recent fires. In areas where habitat conditions have been improving, Lahontan cutthroat trout populations appear to be resilient to effects of catastrophic fires. Lahontan cutthroat trout populations in Frazer and Beaver creeks appear to be increasing, even though both were impacted by fires in 2001. Cutthroat populations in upper Willow Creek appear to be increasing (Evans 2007). No population monitoring for spotted frogs was conducted in 2006.

CUMULATIVE EFFECTS

Livestock grazing, mining operations, industrial development, presence of non-native plant and wildlife species, and agricultural activities in the Study Area are expected to act cumulatively in affecting regional aquatic resources where the same water bodies are impacted. Potential cumulative effects to aquatic resources include degradation of aquatic habitat from livestock grazing, conversion of native riparian/wetland plant communities to communities dominated by invasive non-native weeds, mining (surface disturbance and dewatering activity), other industrial development (e.g., power plants and transmission corridors), service roads, wildfire, and in some cases agricultural diversions. Non-native species including bass and bullfrogs have potential to impact Lahontan cutthroat trout and spotted frogs in the Study Area primarily through predation. Aquatic habitat or species could be lost, either on a temporary or permanent basis. Mitigation programs are expected to reduce these potential impacts.

Land use activities in the Study Area could result in temporary or permanent displacement of some species. One of the major potential impacts to fish and aquatic resources is associated with long-term mine dewatering and drawdown of surface water features, resulting in loss of habitat and decrease/loss of populations. Although the 2006 wildfires were the worst on record for Elko County, no documented loss of Lahontan cutthroat trout or spotted frogs was recorded as a result of the wildfires (BLM 2006d).

Limited surface water impacts resulting from mine dewatering in the Carlin Trend area have been documented in approximately 15 years of monitoring. Groundwater drawdown associated with initial dewatering effort at Betze/Post reduced flow or dried a few springs and changed

the flow and vegetation types in Brush Creek, a tributary to Rodeo Creek before 1998. Near SOAPA, a reach in Maggie Creek approximately 3 miles in length (*the Narrows*) now loses water to the carbonate aquifer as a result of water withdrawals associated with mill supply groundwater pumping and dewatering of the Gold Quarry pit (see *Water Quantity and Quality* section in this chapter). Both of these impacts occurred prior to approval of Leeville and SOAPA and are not included in the predicted impacts of those projects. None of the predicted impacts to the 618 acres of wetland/riparian habitats identified in the Leeville Project EIS (BLM 2002a) or SOAPA EIS (BLM 2002b) documents have occurred (Newmont 2009b).

Newmont's Leeville and SOAPA projects and Barrick's Betze/Post/Meikle Mine complex account for most of the dewatering that has occurred and will continue in the foreseeable future in the Study Area. The combined groundwater cones-of-depression created by dewatering operations could create effects in regional groundwater drawdown, increasing potential for long-term impacts to aquatic organisms and associated habitat. Such impacts would be associated primarily with potential alteration of surface water base-flows and spring flows. Reduced surface water base-flows could eliminate or reduce numbers of fish and many aquatic invertebrates. Extension of the ongoing dewatering discharges would extend the predicted period of reduced base-flows following cessation of mining and thus have the most potential to affect the Humboldt River (see *Water Quantity and Quality* section in this chapter). Mitigation measures implemented by Newmont and Barrick are described later in this section.

Improvement in function and size of wetland/riparian resources in the Study Area as a result of Maggie Creek Watershed Restoration Project, Upper Willow Creek Habitat Enhancement Plan, Susie Creek Riparian Restoration Project, Beaver Creek Riparian Pasture, and improved livestock grazing practices have occurred (see *Stabilization and Rehabilitation Programs* in Chapter 2). The level of recovery documented benefits wildlife including Lahontan cutthroat trout, California floaters, and other aquatic species (Trout Unlimited 2007b).

Infiltration of excess mine water from dewatering operations has resulted in an increase in water levels, or mounding, south of Maggie Creek Reservoir (BLM 2002b), lower Maggie Creek, and upper Boulder Valley (BLM 2000). This mounding in the Maggie Creek area is likely due to seepage from the Maggie Creek Reservoir; reduced pumping from the Carlin Formation near SOAPA; and recharge along Maggie Creek as a result of mine dewatering discharge and irrigation.

In 1992-1993, seepage from the TS Ranch Reservoir resulted in the formation of three new springs (Sand Dune, Knob and Green Springs) in the northeastern portion of Boulder Flat approximately 5 miles south the of the TS Ranch Reservoir (BLM 2000). Extensive stands of riparian and wetlands vegetation has developed with formation of these springs, resulting in approximately 1,200 acres of habitat. The combined flow from these springs is about 6,000 gallons per minute (Listerud 2007). This flow and associated aquatic habitat will continue as long as water from mine dewatering is placed in the subsurface near the TS Reservoir. Eventually, these springs will disappear once discharge to the TS Ranch Reservoir is discontinued. Cessation of flow would result in a loss of the established aquatic habitat and organisms. The spring areas would revert to pre-discharge conditions and would again support upland vegetation species.

Newmont's South Operations Area is the only mining operation discharging to Maggie Creek. Water quality associated with SOAPA and other mine discharges in the Humboldt River basin has been within permit limitations (BLM 2002b). Water quality data collected to date

support the prediction that future mine discharges would not impact water quality in the river. Adverse impacts to surface water quality are not expected from mine dewatering at the Leeville, SOAPA, and Betze projects.

Recalibration of the numerical groundwater flow model (HCltasca 2009) indicates that impacts to riparian vegetation and aquatic habitats along the Humboldt River from base-flow reductions following cessation of pumping are less than projected in SOAPA (BLM 2002b) and CIA (BLM 2000). See *Water Quality and Quantity* section in this chapter.

Mine dewatering could reduce surface flows due to reductions in spring-fed portions of lower Little Jack/Jack, Beaver and Maggie creeks, which have been documented to support Lahontan cutthroat trout. Most Lahontan cutthroat trout habitat in Little Jack, Coyote and Beaver creeks would not be affected because the upper reaches are not connected to the regional aquifer. Flow reductions have also been predicted for lower Susie Creek (no base-flow between years 2033 and 2078), which is considered a potential recovery area for Lahontan cutthroat trout. No fish have been documented in middle Susie Creek (BLM 2006e).

The Maggie Creek Water Restoration Project has improved stream and riparian habitats in the Maggie Creek drainage since 1993, and further improvement is expected. Potential effects on Lahontan cutthroat trout habitat from dewatering activities are considered unlikely due to a relatively small amount of habitat potentially affected and the demonstrated habitat improvement includes all streams in the Maggie Creek drainage containing Lahontan cutthroat trout habitat except Lone Mountain Creek.

Long-term and cumulative mine dewatering could also adversely affect habitat for the Colombia spotted frog, California floater, and springsnails. Flow reductions in the Maggie Creek sub-basin and lower Rock Creek could decrease habitat used by the California floater. Colombia spotted frogs could also be affected in the Maggie Creek drainage. Springsnails are present in at least five springs in the Study Area that could potentially be affected by dewatering drawdown. If any springs are dewatered, the population in that spring would be lost unless it could be relocated.

Measures included in SOAP (BLM 1993), Leeville Project EIS (BLM 2002a), SOAPA (BLM 2002b), and Betze/Post (BLM 2009b) mitigation plans address potential adverse impacts, including dewatering impacts, without regard to whether they occur on public or private land. These mitigation measures are designed to provide not only protection of natural resources but also improvement of most resources in the area, including aquatic habitat. Measures in the plans that deal directly with dewatering include extensive groundwater monitoring and reporting protocols. Monitoring data are used to trigger implementation of mitigation measures, including stream flow augmentation for individual streams, seeps and streams if and when the cone of depression impacts groundwater recharge to those water resources (e.g., Maggie and Susie creeks stream flow augmentation plan). To date, implementation of mitigation plans has had a beneficial impact to fisheries and aquatic resources, including the Lahontan cutthroat trout, in the Study Area.

GRAZING MANAGEMENT AND AGRICULTURE

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for grazing management and agriculture is shown on **Figure 2-3.** Mining and livestock grazing are the dominant land use activities in the Carlin Trend. The rationale for the Study Area is based on the effect mine dewatering

may have on the availability of water in springs, seeps, and streams used to provide water for livestock. The location and availability of water would be used to determine stocking rates and season of usage for pastures within the various allotments.

MONITORING DATA AND NEW INFORMATION

During 2006, an average of 53 pivots was used to irrigate approximately 7,900 acres on the TS Ranch in the Boulder Valley. When dewatering operations are discontinued at Betze/Post and Leeville and dewatering water no longer flows to the TS Ranch reservoir, irrigation in Boulder Valley will likely be reduced to 20 to 30 pivots (Newmont 2009a).

CUMULATIVE EFFECTS

Grazing Management

Cumulative effects on grazing result from wildfire, introduction of noxious weeds, energy development, and mining activity. Mine development in the Study Area has converted approximately 33,500 acres from livestock grazing in 4 allotments within the Study Area to mining and related activities. Reasonably foreseeable mine development in the Study Area between 2010 and 2020 would add approximately 7,200 acres of mining and exploration disturbance. This additional disturbance would have minimal affect on grazing allotments as most development would occur within existing permitted boundaries where adjustments to grazing use have previously occurred. Continued mine dewatering in the Study Area could cause changes in groundwater levels, surface water flow, and/or water quality resulting in reduced stocking rates, livestock distribution, and/or forage utilization.

Construction of the TS Power Plant resulted in conversion of 723 acres of private land from grazing and wildlife habitat to industrial use (ENSR 2004a). The power plant would not affect grazing allotments administered by BLM because the project is occurring on private land in Boulder Valley.

Adjustment to the term grazing permit on the T Lazy S Allotment as a result of the SOAPA project has already occurred. Reduction in permitted use for grazing extends through the life of the mine in most cases. Following reclamation, the majority of mine sites will be made available for grazing. In addition, these sites are often more productive than adjacent native sites as native cultivars are used for reclamation and competition is limited to only those few species in the seed mixture.

Reclamation of mine related disturbances in the Study Area will be incremental as various operations reach the end of active mining and begin closure activities. Approximately 7,800 acres would remain as open pits, some partially filled with water. Approximately 25,700 acres would be reclaimed to provide livestock grazing.

From 1999 through 2008 about 55 percent (approximately 800,000 acres) of land encompassed by the 13 allotments comprising the Study Area have been affected by wildfire. Stocking rates and seasons of use are periodically reviewed and adjusted by BLM in response to the severity of burns in the various allotments effected. Restoration and reseeding efforts to mitigate losses from wildfire have had varying degrees of success. Some areas seeded during the first appropriate season following a fire (fall or winter) exhibited successful seedling establishment, while other areas became infested with noxious weeds (cheatgrass), re-burned within a year or two, or did not respond, possibly due to draught or other

climatic conditions. Some areas had adequate native perennial grasses and did not require herbaceous reseeding following wildfires.

Other restoration projects have included fencing burned areas to allow vegetation to recover and adjusting stocking rates and seasonal use to reflect available forage in the various pastures within each effected allotment. Habitat restoration/reseeding projects from 2000 through 2008 within the Study Area resulted in reseeding a total of approximately 382,000 acres (approximately 55,000 private and 327,000 public).

Agriculture

Cumulative effects to agriculture would include a reduction in irrigated land in the Boulder Valley. Water currently provided by dewatering activities at Barrick's Betze/Post operation and Newmont's Leeville Mine will decrease at a rate commensurate with mining activity and eventually cease to be available for irrigation. At that point, irrigation in Boulder Valley would revert to pumping existing groundwater wells on the TS Ranch. These wells would support 20 to 30 pivots at current application rates (Newmont 2009a) described in Chapter 2 – *Grazing and Agriculture.*

RECREATION

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for recreation covers the administrative area of the Elko District Office as shown on **Figure 2-6**. The administrative area of the Elko District Office encompasses communities where most of the population resides that use recreation facilities in the area.

MONITORING DATA AND NEW INFORMATION

In 2009, BLM developed recreational sites within the administrative area received 6,170 visits; up from previous years. Similar data are collected by Humboldt National Forest for use of developed recreational sites on National Forest System land.

CUMULATIVE EFFECTS

Dispersed recreation opportunities including off-highway vehicle use, hunting, hiking, and sightseeing in the vicinity of the Carlin Trend have been restricted since the early 1980s because of intensified mining and exploration activities in the Carlin Trend. Recent wildfires have further reduced the opportunity for recreation in northeast Nevada.

The gradual but continuous expansion of mining activities in the Carlin Trend would result in less area available for dispersed recreation activity during operation and after cessation of mining until reclamation is complete. Any increase in population associated with mine development would result in more demand for recreation on public land.

To date, recreational use of approximately 33,500 acres in the vicinity of the Carlin Trend has been restricted due to mine development. Reasonably foreseeable mine development from 2010 to 2020 in the Carlin Trend would affect an approximately 7,200 additional acres. Public access to these areas would be restricted to maintain safety and security during mine operations. Upon reclamation and closure these areas would be available for dispersed recreational use.

The overall changes in cumulative impact to recreation and hunting from past, present, and reasonably foreseeable mining related activities is likely to remain minimal, in part because of access restrictions related to mining areas currently exist and unrestricted areas adjacent to the Carlin Trend area remain available for dispersed recreational use.

Employment associated with mine operations, construction activity, and general population growth associated with employment in the Elko area affects the usage of recreational facilities throughout the Study Area. Downturns in employment result in an out migration of workers which in turn reduces the amount of usage of these areas.

ACCESS AND TRANSPORTATION

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for access and transportation includes Interstate 80, State Secondary Route 766, Union Pacific Railroad, and areas adjacent to past, present, and reasonably foreseeable mining operations. These are the primary transportation routes for goods and services in the Carlin Trend and areas where access may be affected by existing and future operations.

MONITORING DATA AND NEW INFORMATION

According to the Nevada Department of Transportation annual average daily traffic count on State Route 766 north of Carlin between 1999 and 2008 ranged from a low of 1,850 in 2002 up to 2,650 in 2006 for an average of 2,275 vehicles over the 10-year period. This amounts to approximately 20 percent of the traffic volume on Interstate 80 between the Elko and Dunphy exits (NDOT 2009).

CUMULATIVE EFFECTS

Access

Foreseeable mine development would result in access restrictions in the vicinity of the Emigrant Mine. Other routes exist in this area that would allow public access to locations blocked by this proposed development.

Numerous two-track roads provide access throughout the Study Area to support livestock grazing operations and public access for recreational purposes. Future mining operations could preclude use of these routes.

Transportation

Cumulative effects on transportation result from increased mining activity, energy development, and increases in population. Rail traffic would increase incrementally as a result of the coal fired TS Power Plant north of Dunphy. Approximately 800,000 tons of coal is delivered by rail annually to the TS Power plant. In addition, a fuel depot located at Dunphy provides diesel fuel to mines in the Carlin Trend.

Trucks are used to transport a variety of materials to mine sites. Shipments of diesel fuel from Dunphy are transported 34 miles to the town of Carlin via Interstate 80. From Carlin, fuel is transported 15 miles along State Route 766, a rural two-lane road to mine access roads.

Future mine development would not likely increase mine related traffic because as activity at some mine areas decreases, other mines begin operation resulting in a relatively static level of employment and corresponding level of traffic. Traffic in the Study Area would be re-directed in response to future mine developments, such as Newmont's Emigrant Project which lies south of Interstate 80. The

Emigrant Project would employ approximately 100 people during construction and about 180 people during mine operations. Most of the work force for the project would come from existing mine-related work forces in the Carlin area (Newmont 2010d).

The majority of mine related traffic would continue to be directed toward Newmont's SOAPA and Barrick's Betze/Post areas for the foreseeable future. Both Newmont and Barrick offer bus transportation for employees from Elko to the mine sites.

VISUAL RESOURCES

Visual resources are evaluated within the context of BLM's Visual Resource Management program. This program has established categories of visual elements throughout the Elko Resource Area. BLM reviews projects which are assessed against their surrounding landscape for compliance with this program.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for visual resources encompasses the Carlin Trend extending from the Hollister Mine in the north to the Emigrant Mine in the south. Key observation points are located along public access points or areas frequented by the public. The rationale for selecting this geographic area is the relationship between mining level disturbance (creation of open pits, waste rock disposal facilities, tailing storage facilities, haul roads, and ancillary mine facilities that modify the natural landscape) and the viewshed from various points where public access is established.

The Study Area is predominately located in a Visual Resource Management (VRM) Class IV area under BLM's VRM program. The objective of Class IV is to provide for managing activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities (e.g., developments) may dominate the view and be the major focus of viewer attention. Impacts of these activities are minimized through careful location, minimal disturbance, and repeating the basic elements (form, line, color, and texture). Class IV allows substantial modifications of the landscape but places emphasis on mitigation, where possible, of those impacts.

MONITORING DATA AND NEW INFORMATION

No new visual simulations have been compiled since 2002. The Emigrant Mine would result in a modification of the natural landscape.

CUMULATIVE EFFECTS

Current and future mine development within the Carlin Trend would not exceed the visual prescriptions of the VRM Class IV designation. Reclamation measures are required for mine disturbances and reclamation would occur on current and future mining activities in the Carlin Trend. Major elements of certain mining facilities would remain after reclamation including pit highwalls and earth-fill structures. Visual contrasts in form, line, and color would remain in the post-mining landscape.

Mine development in the Carlin Trend has resulted in linear features comprised of mine pits, haul roads, waste rock disposal sites, heap leach pads, tailing storage facilities, and mills. Mine developments in many locations are not separable through visual observation. The linear characteristic of these mine developments is expected to be a visual element of the landscape for the foreseeable future. Visual contrast of structures is minimized using colors that blend with the land rather than the sky, and using finishes with low levels of reflectivity.

Night lighting resulting in a visible glow around mining and mill areas will likely continue throughout the life of the respective operations. Following mining operations and ore processing, lighting will be removed during reclamation and closure of the sites. As existing lighting fixtures age and require maintenance they are replaced with components designed to be energy efficient while providing adequate lighting for safety and security purposes. Fixtures with "Dark Sky" features are installed where practicable.

Other land use activities or conditions within these viewsheds have affected and would continue to affect the visual characteristics of the landscape. Burned areas (range fires), power plants, powerlines, pipeline corridors, highways and roads, and livestock grazing affect the natural landscape to varying degrees and at varying seasons and duration. These land use activities and natural phenomena would likely continue to affect visual elements of the landscape into the future. Mitigation of all the visual impacts resulting from mining disturbance may not be possible but the severity could be minimized through project design.

WASTE, SOLID AND HAZARDOUS

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for solid and hazardous wastes and hazardous materials encompasses the permitted mine sites shown on **Figure 2-7**.

MONITORING DATA AND NEW INFORMATION

Current and reasonably foreseeable levels of solid and hazardous waste and hazardous materials used, stored, transported and generated in the Carlin Trend are described in the *Mine and Mineral Development* section of Chapter 2.

CUMULATIVE EFFECTS

Hazardous materials may affect air, water, soil, and biological resources that could potentially be affected by an accidental release during transportation to and from the Carlin Trend and during storage and use at project sites. Solid and hazardous wastes and hazardous materials present in the Carlin Trend are transported, stored, and managed in accordance with applicable federal, state, and local regulations. Non-hazardous solid wastes are disposed in NDEP permitted Class III waivered landfills constructed on mine sites, generally within waste rock disposal facilities.

Trucks are used to transport a variety of hazardous waste and materials to and from mines in the Carlin Trend. Shipments of hazardous substances originate from locations such as Dunphy, Elko, Salt Lake City, and Reno and are transported to the town of Carlin via Interstate 80. From Carlin, the substances travel along State Route 766, a rural two-lane road to the respective mine access roads.

Based on total number of deliveries, the material of greatest concern is diesel fuel. The probability of an accident resulting in a release involving diesel fuel was calculated using Federal Highway Administration truck accident statistics (Rhyne 1994). According to these data, the average rate of truck accidents for transport along a rural interstate freeway is 0.64 accidents per million miles traveled. For rural two-lane roads (State Route 766), the average truck accident rate is 2.19 accidents per million miles traveled.

The probability analysis indicates that the potential for an accidental release of liquids during truck transport during the remaining life of the SOAPA Mine is less than one accident involving a spill of diesel fuel. The total number of truck deliveries of diesel fuel could increase by 500 times before an accidental spill would be

expected. Newmont and Barrick have emergency response measures in place to remediate any spills.

To date, three spills are known to have occurred at the Maggie Creek narrows on Route 766. Spills include 2,000 gallons of diesel in 1999, 300 gallons of grease in 1997, and an unknown quantity of material from a cement truck in 1997. The turn in the road at Maggie Creek narrows is now equipped with flashing lights (McFarlane 2009).

Reasonably foreseeable future activities concerning solid and hazardous waste and hazardous materials are likely to remain at current levels or increase incrementally with expanded mine development. Typically as new mines come into production, others are entering closure and the overall quantity of these materials is maintained. Quantities of these materials used, stored, transported, and generated would begin to decline as reserves in the Carlin Trend are depleted and no new mines are developed.

NOISE

Noise associated with proposed activities on public land administered by BLM is evaluated to determine the potential impacts that could result from a source of noise in an otherwise ambient condition. Noise could impact sensitive receptors including human and animal. No specific noise standard has been adopted that would apply to conditions external to a facility. The Mine Safety and Health Administration and Occupational Safety and Health Administration regulate noise levels in the work place as those regulations apply to worker safety.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) encompasses the active mining areas in the Carlin Trend (Barrick Betze/Post area to SOAPA). Noise results from mining activities including drilling, blasting, loading, hauling, and processing of ore and waste rock. These activities encompass a wide range of noise levels which are affected by mobility of the source of noise (truck haulage), topography of the area (blocking noise), temperature of the air (cold air transmits noise more efficiently than warm air), and frequency of the source (blasting vs. milling operations). Distance to sensitive receptors also affects analysis of whether noise generated by a specific activity would be a nuisance.

MONITORING DATA AND NEW INFORMATION

Noise generated by mining and ore-processing activities in the Carlin Trend has changed over time with the advancement of exploration and mining operations. Noise generated by drilling equipment, blasting, truck haulage or ore and waste rock, and milling operations has affected ambient noise levels that existed prior to major mine development in the Carlin Trend. Noise generated from these activities ranges from infrequent noise resulting from blasting of rock in mine pits; periodic noise associated with haul truck traffic; and constant noise associated with milling operations. Noise levels associated with exploration and mining activity and locations of sensitive receptors are described in the Leeville Project EIS (BLM 2002a) and SOAPA EIS (BLM 2002b).

Proposed development of Rodeo Creek Gold's Hollister Development Block would create a source of noise during construction and operation of the proposed mine. The proposed project is an underground mine and consequently, noise associated with blasting would not be noticeable at the surface; especially as workings advance to depth. Noise associated with surface operations is not known at this time and is dependent on the mine and ore processing plans currently in development. Other sources of noise in the Study Area

include off-highway vehicles, firearms, and highway traffic. No monitoring data are available to characterize these sources.

CUMULATIVE EFFECTS

Noise does not accumulate in the environment; it can have a direct impact on sensitive receptors but it does not form an additive or cumulative effect on the environment. No cumulative effects from noise in the Study Area have been determined.

SOCIAL AND ECONOMIC RESOURCES

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for social and economic resources encompasses the area between Elko and Winnemucca on Interstate 80, including Elko, Eureka, Humboldt and Lander counties (**Figure 3-11**). The rationale for selection of this Study Area is outlined below:

- Residential patterns of mining company employees determine where they are likely to spend their salaries. Employees of mining companies do not necessarily live in the closest community to their employment nor do they live in the local governmental unit which receives increased tax revenues as a result of the facility. According to the U.S. Department of Commerce (2009), commuting data for 2006 suggest that:
  - Elko County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 16.4 percent of total income in the county.
  - Eureka County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents approximately 649.3 percent of total income in the county.
  - Humboldt County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents 6.5 percent of total income in the county.
  - Lander County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 10.1 percent of total income in the county.
- Availability of local shopping opportunities determines where people are likely to spend their disposal income in the four-county Study Area. The majority of shopping opportunities, including availability of medical, financial, and personal services, are located in Elko (Elko County) and Winnemucca (Humboldt County). Dollars from Carlin and Battle Mountain "bleed" out of Eureka and Lander counties to Winnemucca and Elko.
- Most communities within the four-county area have a distinct sense of being a "local community" while sharing basic values and beliefs. Towns in the Study Area are remote from the rest of the state, connected by Interstate 80.

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

SOCIOECONOMIC RESOURCES
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-11

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig_3-11_Socioeconomic.mxd

MONITORING DATA AND NEW INFORMATION

The following sections provide updated baseline data on social and economic resources, where available.

Population Trends and Demographic Characteristics

The Study Area contains predominantly white communities, with Hispanic, Basque, and American Indian (mostly members of the Te-Moak Tribe of Western Shoshone) populations. Nevada is one of the fastest growing states in the U.S. (24.9 % since 2000 Census). The two largest counties (Elko and Humboldt) have shown modest growth, while the two smallest counties (Lander and Eureka) lost population during the same period (**Table 3-13**). The towns of Elko (Elko County) and Winnemucca (Humboldt County) are well-developed and growing communities on either side of the Study Area, with smaller communities of Carlin and Battle Mountain in between Elko and Winnemucca.

The Te-Moak Tribe of Western Shoshone Indians of Nevada is a coalition government with headquarters in Elko, serving four distinct Shoshone colonies in Nevada: Battle Mountain Colony, Elko Colony, South Fork Colony, and Wells Colony. The Elko Colony encompasses approximately 190 non-contiguous acres adjacent to the City of Elko. The Battle Mountain Reservation is located on the west side of the town of Battle Mountain.

Housing

The number of housing units available has not kept pace with population growth experienced in Elko and Humboldt counties from 2000 to 2007 (**Table 3-14**).

Government

Residents of the Study Area are governed by elected county commissioners and city councils if they live within municipal boundaries. Residents of the Elko and Battle Mountain Bands elect Tribal Councils.

TABLE 3-13
General Demographic Information

Characteristic	Elko County	Eureka County	Humboldt County	Lander County	State of Nevada
Total population (2008 estimate)	47,071	1,628	17,763	5,086	2,600,167
Percent Population change (April 1, 2000 to July 1, 2008)	3.9	-1.4	10.3	-12.2	30.1
Percent White, not Hispanic (2007)	70.6	81.6	71.5	74.1	58.0
Percent Hispanic or Latino (2007)	21.8	12.0	21.4	18.6	25.1
Percent Black (2007)	1.1	0.4	0.7	0.5	8.0
Percent American Indian and Alaska Native persons, percent, 2007	5.3	1.7	4.9	5.2	1.4
Persons below poverty, percent, 2007	8.7	9.1	11.4	10.5	10.6

Source: U.S. Census Bureau 2009.

Tax Revenues

Mining generates tax revenue for government in various ways:

- Net Proceeds Tax on Minerals, is an *ad valorem* tax assessed on minerals mined or produced in Nevada when they are sold or removed from the state.
- Property Tax, based on personal property (such as equipment) and real property (buildings) and paid to a city or county.
- Sales Tax, based on goods and services purchased from Nevada registered vendors and paid where goods and services are delivered.
- Use Tax, based on purchases from non-Nevada registered vendors, paid at point of final destination.
- Excise Tax, based on purchases of specific commodities such as diesel fuel and paid as part of the bill for the product.
- Payroll Tax, based on direct employee payroll and paid to relevant government agencies.
- Federal income tax based on an individual company's corporate-wide profits, and filed and paid in a consolidated global return to the U.S. Treasury.

The State of Nevada collects taxes on a multitude of items, including gaming, sales, and use taxes. Estimated state and local taxes paid by the mining industry in 2007 increased by almost 3.7 percent over 2006 based on information from the Nevada Department of Taxation and industry surveys. This increase follows a 45 percent increase in estimated taxes paid in 2006 over 2005. This represents the highest estimate over the past two decades. Total estimated taxes paid by mining companies in 2007 were $199.5 million, up from $194.2 million in 2006. These figures include taxes paid by operators and does not include taxes paid by industry employees or suppliers (Dobra 2007).

TABLE 3-14
Housing Data, 2000, 2005 and 2007

Characteristic	Elko County	Eureka County	Humboldt County	Lander County	State of Nevada
Total Housing Units (2007)	19,420	1,054	7,291	2,757	1,102,379
Percent Change (April 1, 2000 to July 1, 2005)	3.3	3.8	1.1	-0.5	23.2
Median Value of Owner-Occupied Housing Units, 2000	$123,100	$89,200	$117,400	$82,000	$142,000

Source: U.S. Census Bureau 2009.

Mining is the only industry that pays taxes to state and local government on the basis of "Net Proceeds," a classification in which proceeds from non-metal mining production is taxed. Mineral operations are allowed to deduct direct costs of production, such as mining and milling, and are taxed on the net amount (Newmont 2005).

In 2006, Net Proceeds of Minerals in the State of Nevada were $1.27 billion and increased to $1.53 billion in 2007. Taxes on those proceeds increased about 23 percent, from $61 million in 2006 to over $75 million in 2007. In 2007, approximately 51 percent of the Net Proceeds on Minerals tax generated went to the State of Nevada general fund (Dobra 2007).

Table 3-15 presents the amount of net proceeds tax distributed to counties in which it was earned for 1999 through 2008. Mining activity has increased in Eureka and Humboldt counties, and has decreased in Elko and Lander counties over the same period. This is common in the Study Area as mines close and new mines are developed. In Fiscal Year 1999-2000, mining in the Study Area contributed to over 88 percent of net proceeds in the state; by 2008, mining contributed only 53 percent of net proceeds in the state.

Property taxes paid on property, plant, and equipment stay almost exclusively in the counties and special tax districts where mines are located. A small portion of property taxes is dedicated toward state debt repayment (Dobra 2007).

Various components of sales and use taxes are distributed differently. A portion (2 percent) goes to the general fund, another goes to school districts statewide on a per pupil basis, but the bulk is distributed on a per capita basis – *i.e.*, most of these funds go to Clark County (Las Vegas) with about 72 percent of the state's population (Dobra 2007).

Employment

Employment in Nevada in 2008 was dominated by service industries (73.2%) and specifically the leisure and hospitality industries with over 26 percent of the workforce in the sector. The gaming industry drives Nevada's economy. Gaming, hotel, and recreation areas employ the largest numbers of workers in the state (332,550 in 2008). The next largest employment sector for the period was trade, transportation, and utilities with over 18 percent of the jobs statewide. Just over one percent of jobs statewide in 2008 were in the natural resource and mining industries (Nevada Department of Employment, Training, and Rehabilitation 2009).

TABLE 3-15
Net Proceeds of Minerals Tax Distribution (in dollars), 2000 - 2008

Fiscal Year	Elko	Eureka	Humboldt	Lander	State of Nevada/Total County Distribution
2000	$3,189,780	$1,911,738	$59,589	$7,644,328	$14,525,017
2001	2,891,062	2,968,354	496,667	5,822,029	14,114,324
2002	1,264,908	1,278,428	535,710	5,656,449	11,425.034
2003	1,561,131	1,222,059	1,076,801	4,725,660	13,756,888
2004	2,049,505	3,331,918	1,577,453	6,415,111	19,093,251
2005	2,003,547	3,356,887	191,595	9,505,593	21,886,103
2006	2,044,142	5,272,665	1,333,320	6,602,800	23,357,518
2007	2,489,641	8,089,017	2,584,508	1,141,634	32,345,089
2008	1,207,086	9,946,215	5,380,223	3,067,539	36,624,590
Percent Change 2000-2008	-62.2	420.3	8,928.9	-59.9	152.1

Source: Nevada Department of Taxation 2009.

The economy of the Study Area is dominated by government and the mining industry. Employment by major industry with statewide employment by the same sector is shown in **Table 3-16**. Employment numbers are based on work location not residence, which is why Eureka County has more employees in the natural resources and mining sector than it has residents. Several major mines are located in Eureka County including Barrick Goldstrike Mine's Betze/Post operation and Newmont Mining Corporation's North Operations Area.

Employees of mining companies do not necessarily live in the closest community to their employment nor do they live in the local governmental unit which receives tax revenues as a result of the facility. According to U.S. Department of Commerce (2009), commuting data for 2006 suggest that Elko County is a bedroom community where 16.4 percent of the total income in the county is derived from people commuting to jobs out of the county.

In addition to future mine development in the Carlin Trend, the new TS Power Plant near Dunphy, and rail terminals in Elko and Winnemucca, provide additional employment.

These private sector investments will result in substantial contributions to employment levels in the Study Area.

Income

Mining provides its employees with the highest average salary of any industry in Nevada. Average earnings in Nevada for all mining increased from $69,368 in 2006 to $77,064 in 2008 (**Table 3-17**). Average earnings in metal ore mining increased from $73,892 in 2006 to $78,572 in 2008. The average salary paid to mine workers extracting gold ore in Nevada in 2008 was $78,728 (Nevada Department of Employment Training and Rehabilitation 2009).

Goods and Services

Detailed Information regarding total expenditures by Barrick and Newmont within the Study Area is not available, however data for the broad categories of contracted services, consumables, and supplies was provided. Information for contracted services, consumables, and supplies for Halliburton's Rossi Mine or Rodeo Creek Gold's Hollister Development Block was not available.

Newmont and Barrick collectively spend in excess of $310 million annually on contracted services. The number of contracted employees for each company varies seasonally but ranges from 400 to 600. Total annual expenses for consumables (e.g., diesel fuel, gasoline, propane, and cyanide) exceeded $650 million for Newmont and Barrick operations combined in 2006. Annual expenditures for supplies (e.g., office supplies, safety equipment, vehicle and equipment parts) ranged from $35 to $78 million for Barrick and Newmont, respectively in 2006 (Newmont 2010d; Barrick 2007d).

CUMULATIVE EFFECTS

Characteristics of the socioeconomic environment that could have cumulative impacts from the remaining development associated with the Leeville Project and other reasonably foreseeable projects in the area include population variations, availability of housing, public infrastructure and services, employment levels, tax revenues, and the effects of discharge and dewatering within in the Carlin Trend and the Humboldt River Basin. Chapter 2 – *Past, Present, and Reasonably Foreseeable Future Activities*, describes land uses that affect socioeconomic resources.

TABLE 3-16
Employment by Sector, State of Nevada and Study Area Counties, 2008

Sector	State of Nevada		Elko County		Eureka County		Humboldt County		Lander County	
	Employees	Percent	Employees	Percent	Employees	Percent	Employees	Percent	Employees	Percent
Goods Producing - Private	**179,100**	**14.3**	**3,950**	**18.5**	**3,960**	**90.8**	**2,440**	**32.1**	**1,370**	**50.6**
Natural Resources & Mining	14,570	1.2	2,480	11.6	3960	90.8	1,780	23.4	1,370	50.6
Construction	116,450	9.3	1,250	5.9	NA	NA	350	4.6	NA	NA
Manufacturing	48,080	3.8	220	1.0	NA	NA	310	4.1	NA	NA
Service Providing - Private	**916,350**	**73.2**	**13,620**	**63.8**	**190**	**4.4**	**3,740**	**49.1**	**810**	**29.9**
Trade, Trans., Warehouse & Util.	230,750	18.4	3,810	17.8	130	3.0	1,410	18.5	530	19.6
Information	15,080	1.2	190	0.9	NA	NA	80	1.1	NA	NA
Financial Services	61,480	4.9	540	2.5	NA	NA	110	1.4	20	0.7
Prof. & Business Services	152,010	12.1	970	4.5	10	0.2	490	6.4	20	0.7
Educational & Health Services	95,340	7.6	1,300	6.1	NA	NA	310	4.1	30	1.1
Leisure & Hospitality	332,550	26.6	6,190	29.0	50	1.1	1,180	15.5	210	7.7
Other Services	29,140	2.3	620	2.9	NA	NA	160	2.1	NA	NA
Unclassified	**1,370**	**0.1**	**0**	**0.0**	**90**	**2.1**	**-10**	**-0.1**	**110**	**4.1**
Subtotal - Private	**1,095,450**	**87.5**	**17,570**	**82.3**	**4,150**	**95.2**	**6,180**	**81.2**	**2,180**	**80.4**
Service Providing – Public	**156,120**	**12.5**	**3,790**	**17.7**	**210**	**4.8**	**1,430**	**18.8**	530	**19.6**
TOTAL PRIVATE AND PUBLIC	**1,251,570**	**99.9**	**21,360**	**100.0**	**4,360**	**98.0**	**7,610**	**100.1**	**2,710**	**96.1**

Source: Nevada Department of Employment, Training, and Rehabilitation 2009. NA = Information not available.

TABLE 3-17
Income and Earnings Data

Characteristic	Elko County	Eureka County	Humboldt County	Lander County	State of Nevada
Average Annual Wages, All Industries, 2008	$40,664	$76,856	$42,380	$52,208	$43,004
Average Annual Wages, All Mining, 2008	$93,496	$80,184	$74,932	$71,916	$77,064
Average Annual Wages, Metal Ore Mining, 2008	$85,540	$80,236	$77,428	$74,360	$78,572
Average Annual Wages, Gold Ore Mining, 2008	$85,540	$80,236	$77,636	$74,360	$78,728

Source: Nevada Department of Employment, Training, and Rehabilitation 2009.

Population Trends and Demographic Characteristics

The number and variety of reasonably foreseeable projects planned in the Study Area would not likely result in additional workers moving into the area.

Transient workers are often involved in the construction of mines and related facilities. These workers are less likely to become part of the community through activities or socializing and they face a stigma for not being long time members of the community.

Prostitution is legal and regulated by the State in the Study Area. The Battle Mountain Social Impact Assessment (Newmont 2005) reported that prostitution does not seem to have a significant impact on social cohesion as it was not identified during discussions in the Battle Mountain community. Prostitution is impacted by the mining industry mainly through influx of contractors during construction phases of large-scale projects. These contractors are generally single men, or men who have left their families temporarily for work. These men tend to frequent local bars and gaming establishments.

Housing

Long-term housing impacts generated by the remaining development of the Leeville Project combined with other reasonably foreseeable projects in the Study Area depend in large part on where people (construction and operational workers) choose to live. The majority of workers in the Study Area live in Elko and Humboldt counties and commute to work in Eureka and Lander counties. Lack of new housing to meet current demand throughout the Study Area could create the need to build sub-standard homes – built to house people during a boom – but which later become blights which generate little to no property tax revenue, but continue to put pressure on public infrastructure and services budgets (Newmont 2005). **Table 3-14** presents housing data for 2000, 2005, and 2007. Housing in Eureka and Lander counties is less expensive than housing in Elko and Humboldt counties. This may be because much of the housing in Eureka and Lander counties consists of trailers, mobile homes, and pre-fabricated units built for a transitional group of home buyers.

The Battle Mountain Social Impact Assessment (Newmont 2005) indicates real estate markets and property values are determined by the

quantity and perception of supply and demand. Perception in Battle Mountain in early 2005 was that the community was going through a boom and new, temporary, and permanent residents to the town required housing. The effect is often an increase in property values of existing structures and an added impetus for adding housing units. However, unrealistic speculation about home prices on the part of sellers and an overall trend of rising property values can price some people out, negatively affecting the availability and affordability of housing. In addition, previous experience throughout the Study Area is that property values dropped precipitously when mines have closed, with many owners choosing to abandon their properties and allow foreclosure given an inability to sell homes even at depreciated values (Newmont 2005).

In anticipation of the TS Power Plant, Newmont created additional housing supply with redevelopment of a trailer park in Battle Mountain. However, construction of the Power Plant brought upwards of 900 contracted employees and put pressure on availability of local housing.

Public Infrastructure and Services

Rapid population growth and loss (boom/bust cycles) also place a burden on fire, police, and Emergency Medical Services response to public safety incidents. Government agencies throughout the Study Area struggle with recruiting and retaining qualified personnel as many are drawn away from these occupations by the comparatively high wages of the mines.

The influx/loss of school-aged children into local school districts is also a major concern for local planners. With a state mandate of maximum class sizes of 16 in elementary and middle schools, the addition of several new students could necessitate hiring additional teachers. Funding for school districts is awarded on "two-year hold harmless," which compensates districts for either their actual student population or the student population in either of the two previous years, whichever is higher.

Regional Economy and Employment

Within a county economy or region, there are numerous economic employment sectors each fulfilling different demands of the local economy. All sectors are dependent upon each other to some degree. A change in employment level in one sector will impact either directly or indirectly the activity and viability of other employment sectors in the local economy. In order to show these interdependencies and interventions between sectors, an input–output model IMPLAN (Minnesota IMPLAN Group, Inc. 2006), was used to estimate economic, employment, and labor income impacts of the Hard Rock Mining Sector on the Elko Micropolitan Statistical Area, which includes both Elko and Eureka counties (**Table 3-18**).

Direct effects are understood to be those activities or expenditures associated directly with the Hard Rock Mining Sector. Indirect effects include those additional expenditures between economic sectors after the initial direct expenditure is made. Induced impacts or effects are the additional expenditures and economic activity attributable to household interactions.

In addition to the direct employment and income provided by mines in the Study Area, economic activity creates indirect and induced employment income in the local county economies. Mine employees spend their income in the local area for goods and services.

TABLE 3-18
Economic, Employment, and Labor Income of the Hard Rock Mining Sector on the Elko Micropolitan Statistical Area, 2007

Category of Impacts	Direct Effects[1]	Indirect[2] and Induced Effects[3]	Total Effects
Economic	$2,256.433,133	$681,372,997	$2,937,806,131
Employment	5,905	5,106	11,011
Labor Income	$537,516,769	$197,629,036	$735,145,806

Elko Micropolitan Statistical Area includes Elko and Eureka counties.

[1] Direct effects are those activities or expenditures associated directly with the Hard Rock Mining Sector.

[2] Indirect effects include those additional expenditures between economic sectors after the initial direct expenditure is made.

[3] Induced impacts or effects are the additional expenditures and economic activity attributable to household interactions.

Source: Ciciliano *et al.* 2008; Minnesota IMPLAN Group, Inc. "IMPLAN Pro Data for Elko County and Eureka County, 2004" Minnesota IMPLAN Group, Inc. Stillwater, Minnesota, 2006.

The employment multiplier from mining has been estimated to be 1.7, although there is support for a range of 1.5 to 1.9 in some literature (Harrington 2005). Price and Harris (2007) estimated that each direct employee in the hard rock mining industry generates demand for an additional 0.85 indirect and induced employees in the Elko/Eureka counties economy.

Cumulative impacts on employment and income in the Study Area are dependent on timing of job openings because job losses may be offset or at least mitigated by new projects or expansions of existing ones. However, there is no guarantee the closure of one project and the construction/operation of another project will be offset in sequence or in number of jobs and economic opportunities. If any of the existing projects were to close without one of the reasonably foreseeable projects coming online, communities in the Study Area would be impacted as some people would lose their jobs and incomes. Economic benefits of extending mining operations in the Carlin Trend would help maintain the status quo of the Hard Rock Mining Sector influence on the economy in the Study Area.

The economy of the Study Area is dominated by government and the mining industry. Employment numbers are based on work location not residence, which is why Eureka County has more employees in the natural resources and mining sector than it has residents (**Tables 3-13** and **3-16**). Several major mines, which impact the Elko MSA, are located in Eureka County including Barrick's Betze/Post-Meikle operations and Newmont's North Operations Area, which includes the Genesis-Bluestar operations. In addition, the Cortez Mine in Lander County and the Bald Mountain Mine in White Pine County, both of which are closer to Elko than any community within their respective counties, contribute to employment and income in the Study Area.

Employees at these mining facilities do not necessarily live in the closest community to their place of employment or in the local governmental unit which receives tax revenues from those facilities. For example, more than 4,000 mine workers reside in the Elko, Carlin, and Spring Creek areas, but are employed at mines outside Elko County. The following are the major, but not the only, operations located outside Elko County that employ Elko area residents:

- Bald Mountain Mine – White Pine County (179)
- Cortez – Lander County (673)
- Barrick Betze Pit – Eureka County (1,131)
- Newmont Carlin Operations – Eureka County (2,127)

Newmont employs approximately 1,300 persons for its Carlin Trend surface operations which include several mining and exploration projects. Among them are Gold Quarry, Pete Project, Genesis-Bluestar, Bootstrap, and the proposed Emigrant Mine. Employees of the surface operations are moved from project to project as needed, thus one project may be vacant for an extended period of time before another project winds down releasing personnel. Thus mining companies gain some flexibility in producing cash flow, can adjust mining to feed particular ore types to processing facilities, and can maintain a stable work force, which is critically important given the training and skills required for mining.

Ongoing mineral exploration in Nevada has increased from $50 million in 2001 to nearly $168 million in 2007. Proven and probable reserves in Nevada (i.e., gold in the ground that can be mined at a profit) totaled over 70 million ounces in 2007. Most companies have used a price of under $600 per ounce to calculate reserves which equates to a conservative estimate of an additional 12 years of production at current levels. Over the past two decades reserve estimates have been consistently represented at 10 to 12 years worth of production, so there are no indications that Nevada is running out of gold (Dobra 2007).

Ruby Pipeline Project

Construction of that portion of the Ruby Pipeline located in the Study Area would occur within a 10-month period and employ 400 to 500 workers. An additional 150 to 200 workers would be required for construction of the Wieland Flat Compressor Station about 35 miles north of Elko. Up to 15 percent of the workforce would be local hires and about 85 percent would be non-local (FERC 2009).

The temporary influx of non-local construction workers would increase demand for housing, resulting in increased revenues to individuals and businesses with space for rent. Temporary housing in the Elko area is available in the form of daily, weekly, and monthly rentals at motels, hotels, casino hotels, campgrounds, and recreational vehicle (RV) parks, bed and breakfast, boarding houses, apartments, and houses. Construction workforce demands may compete for temporary housing with mine workers in the Elko area. Availability of local rental housing combined with the number of non-local workers from the Project may exceed the available housing in the Elko area (FERC 2009).

Expenditures for payroll and local purchases would provide a short-term beneficial impact to local businesses and long-term tax revenue to state and local governments.

Tax Revenues

In addition to employment taxes, Net Proceeds of Minerals taxes paid by mineral development are a primary tax revenue source. Net Proceeds taxes are generated for the state of Nevada in the county where the ore is mined, not the county where employees live. Companies pay property and sales taxes, and employees and supply chain contractors who reside locally generate tax revenue through their property and local purchases. For example, Net Proceeds of Minerals taxes generated in Eureka County by the multitude of mining activities but the majority of employees live in Elko County.

A large portion of Net Proceeds of Minerals tax benefits will accrue to Eureka and Humboldt counties where most mining activity occurs. In 2007, approximately 51 percent of the Net Proceeds on Minerals tax generated went to the state of Nevada general fund (Dobra 2007).

Property tax from miners' homes and suppliers' businesses is the primary tax revenue Elko County receives from mining. The Battle Mountain Social Impact Assessment (Newmont 2005) provides a description of the potential impact of net proceeds tax:

> "In 2004, net proceeds taxes (largely from the non-Newmont Cortez mine) represented 16.00% of the $7,232,223.00 Lander County budget. Once Phoenix begins operations, Lander County is expected to receive approximately $1.4 million annually in taxes, which would have represented 19.36% of total Lander County revenue in 2004. Since 2000, Lander County has used net proceeds revenue to cover its operating expenses. A loss in this revenue stream would require cuts in county administration and basic services. In addition, Lander County's weak tax base (due to low-value and non-assessed residences and economic leakage of resident income) also makes it more dependent on the direct net proceeds and property tax revenue streams from Newmont. Unless the tax revenue streams associated with Phoenix mine are offset by other mines or employers and/or a more diversified tax base, Lander County's financial solvency will be vulnerable at the closure of Phoenix, potentially throwing Battle Mountain and the surrounding area back into the familiar "boom bust" economic cycle (Newmont 2005).

In 2007, Newmont paid $4.8 million in net proceeds taxes to Eureka County and $367,000 to Elko County. Sales and use taxes paid by Newmont in 2007 included $14.5 million to Eureka County and $6.2 million to Elko County. Newmont paid $172,000 in property taxes to Elko County and $4.2 million in property taxes to Eureka County (Newmont 2008c). In the period from 2006-2007, these payments represent 0.5 percent of Elko County's total property tax revenue ($29.8 million) and 34 percent of Eureka County's total property tax revenue ($12.3 million). Total taxes paid by Newmont in 2007 to Elko and Eureka counties were $30.2 million.

Net Proceeds on Minerals tax is clearly a vital part of revenue for counties that have mining benefit. Other counties that house and provide services to miners must find money from other sources to provide those services.

Dewatering and Discharge

Areas potentially affected by mine dewatering are described in the CIA report (BLM 2000), Leeville Project EIS (BLM 2002a), SOAPA EIS (BLM 2002b), and the Betze Pit Expansion Project Draft Supplemental EIS (BLM 2009b). Socioeconomic concerns in this area include potential impacts from lowered water levels in wells, reduced flow in springs (livestock and wildlife impacts), reduced stream flow (irrigation and livestock impacts), and development of sinkholes (possible damage to private property and/or natural resources) (BLM 2002a). Details regarding groundwater and surface water conditions in the Study Area are included in this chapter under the *Water Quantity and Quality* section.

ENVIRONMENTAL JUSTICE

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for environmental justice encompasses the area between Elko and Winnemucca on Interstate 80, including Elko (including the Elko Band Colony), Eureka, Lander (including the Battle

Mountain Band), and Humboldt counties. Both bands are part of the Te-Moak Tribe of Western Shoshone Indians. These bands represent minority populations within the vicinity of the Carlin Trend.

MONITORING DATA AND NEW INFORMATION

No new census data for the period 2002 to 2009 has been collected. Information contained in this section is based on the most recent census (2000).

IDENTIFICATION OF MINORITY AND LOW INCOME POPULATIONS

Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders. *Low-income populations* are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of four was $17,603 and $8,794 for an unrelated individual (U.S. Census Bureau 2002). Estimates of these two populations were then developed to determine if environmental justice populations exist in the Study Area.

The Council on Environmental Quality identifies these groups as environmental justice populations when either (1) the minority or low-income population of the affected area exceeds 50 percent or (2) the minority or low-income population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis. In order to be classified meaningfully greater, a formula describing the environmental justice threshold as being 10 percent above the State of Nevada rate is applied to local minority and low-income rates.

In 2008, the Study Area contained 71,548 persons of which approximately 19,535 (27.3%) were minorities and approximately 6,802 (9.5%) were living below the poverty level. Minority and low-income populations were consistently lower in each of the counties in the Study Area than for the State of Nevada (**Table 3-13**). Both the Elko Band Colony in Elko County and the Battle Mountain Band of the Te-Moak Western Shoshone tribe in Lander County meet the description of environmental justice populations, because of minority and poverty status (**Table 3-19**). For each Band the percent of minority persons and the percent of people below the poverty level are more than 10 percent above the State of Nevada rate.

TABLE 3-19
Minority and Low-Income Populations, 2000

Location	Total Population	Percent Minority	Percent Below Poverty (1999)
Elko County[1]	47,114	29.1	8.7
Elko Band Colony[2]	*729*	*86%*	*23.0*
Eureka County[1]	1,480	16.8	9.0
Lander County[1]	17,446	26.8	9.8
Battle Mountain Band[2]	*124*	*90.3*	*28*
Humboldt County[1]	5,272	22.5	9.5
State of Nevada[1]	2,495,529	40.0	11.1

Source: [1] U.S. Census Bureau 2007; [2] Sonoran Institute 2007.

CULTURAL RESOURCES

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) and Area of Potential Effect for cultural resources extends from the Bootstrap Mine in the north to the SOAPA Project in the south (**Figure 3-12**). The Study Area boundary was determined by the BLM to include those mines and related facilities that encompass the core area of the Carlin Trend, including areas currently subjected to open pit and underground mining activities.

MONITORING DATA AND NEW INFORMATION

A summary of cultural resource inventories organized by company name/mine operator is presented in **Table 3-20**. A complete listing of all cultural surveys completed and sites mitigated in the Carlin Trend (Area of Potential Effect) is included as **Appendix C.**

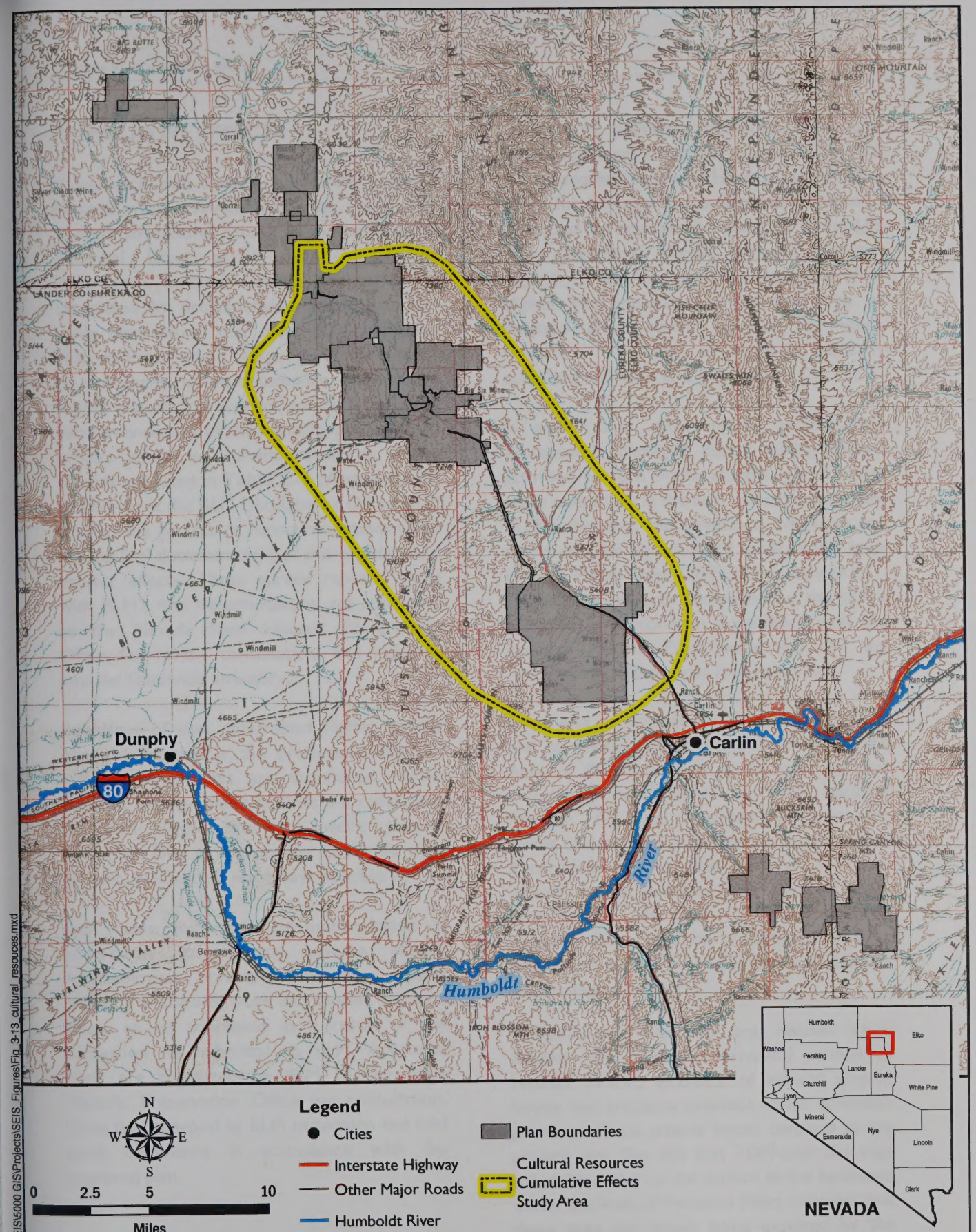
Since 2002, the Leeville project has been implemented as described in Chapter 1 – *Project History and Status.* Mining is underway and new facilities have been constructed and placed in operation. Other projects have been constructed within the Carlin Trend during the period (see Chapter 2 – *Mine and Mineral Development*). Cultural resource surveys were completed prior to initiation of these projects (Leeville [BLM 2002a,] and SOAPA EIS [BLM 2002b]).

Prior to 2007, 65 Cultural Resource Inventories/Reports had been prepared in the Study Area (**Appendix C**). Barrick and Newmont are planning projects for which cultural surveys have been compiled or will be prepared in the future.

Approximately 5,800 acres would be disturbed in the Study Area between 2010 and 2020 by reasonably foreseeable projects (**Table 2-3**). (Note: The Emigrant Project area [approx. 1,400 acres] is outside the Study Area for cultural resources). The 5,800 acres within the Study Area have been previously surveyed with five sites identified as potentially eligible for listing on the National Register of Historic Places. Barrick is currently mitigating these sites as part of its Betze/Post expansion (Hockett 2007).

TABLE 3-20
Summary of Cultural Resources Inventories by Mine Operator

Barrick Goldstrike Mines Inc.	10 Cultural Resource Inventories/Reports
	248 Sites or Isolated Finds
	45 Eligible Sites, 37 Unevaluated, 166 Ineligible
Marigold Mining Co.	6 Cultural Resource Inventories/Reports
	55 Sites, 40 Isolated Finds
	15 Eligible Sites, 1 Unevaluated Site, 39 Ineligible
Newmont Mining Corp.	34 Cultural Resource Inventories/Reports
	343 Sites or Isolated Finds
	79 Eligible Sites, 6 Unevaluated, 272 Ineligible
Other	15 Cultural Resource Inventories/Reports
	90 Sites or Isolated Finds
	16 Eligible Sites, 20 Unevaluated, 54 Ineligible



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Tuscarora Field Office
Elko, Nevada

CULTURAL RESOURCES AND AREA OF POTENTIAL EFFECT
CUMULATIVE EFFECTS STUDY AREA
Leeville Project
Final Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-12

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig 3-13_cultural_resouces.mxd

CUMULATIVE EFFECTS

Compliance with Section 106 of the National Historic Preservation Act has minimized impacts to cultural resources in the Area of Potential Effect as a result of mining disturbance. Cultural resource inventories are completed by professional archaeologists (3rd party contractors) that meet BLM and State Historic Preservation Office requirements prior to any mining-related disturbance. Contractors report results of surveys to BLM including recommendations of site eligibility and potential project effects to cultural resources. These reports are listed in **Table C-1 (Appendix C)** and on file at the BLM Elko District Office. BLM reviews the contractor recommendations when making final determinations of site eligibility and project effects. These survey reports, along with BLM's final determinations, are submitted to the Nevada State Historic Preservation Office for review consultation, and inclusion into the Statewide Inventory.

Avoidance of sites determined eligible for the National Register is the preferred mitigation measure when sites are threatened. When possible, mining-related facilities are redesigned to avoid eligible sites or specific cultural resources. Due to the number of eligible sites present, avoidance is not always possible. In

such cases, excavation by archaeologists is undertaken to mitigate adverse effects. Archaeologists prepare mitigation plans including a scope of work and specific scientific issues to be addressed as a result of the excavation for submittal to BLM. Approved plans are submitted by BLM to the State Historic Preservation Office for consultation. Upon final approval by BLM excavation and field work commence in accordance with the approved plan.

Analysis of artifacts recovered from site investigations are contained in reports to BLM and subsequently to State Historic Preservation Office for inclusion in the Statewide Inventory. Mitigation has been carried out at 57 of the 155 sites determined eligible for the National Register (37%). Approximately two-thirds of all eligible sites recorded within the Area of Potential Effect remain available for future research. A listing of mitigated sites is contained in **Table C-2 (Appendix C)**.

In some cases, sites initially avoided, are subsequently damaged during mining related activities. In such instances, mining companies cease operations in the area, inform appropriate BLM authorities, and develop a mitigation and treatment plan for submittal to BLM and State Historic Preservation Office. Subsequent field and archival research completed for the site is compiled in a report in accordance with the National Historic Preservation Act and the Archaeological Resources Protection Act.

Some loss to archaeological resources occurs due to mining related disturbance within the Area of Potential Effect, particularly to sites determined not eligible for the National Register. All sites represent nonrenewable pieces of America's prehistoric or historic past. Recordation of these sites preserves a written record of their existence to be used by future researchers interested in understanding Nevada's past. Mitigation of cultural resources preserves a picture of the past through scientific archaeological research.

Archaeological sites do not remain intact forever. The paleo-environmental record of Nevada exhibits evidence of natural erosive forces that eradicate previous traces of human presence. These erosive forces continue to the present day. The fact that 3,000-year old sites are visible today on the surface of the landscape within the Area of Potential Effect indicates that these sites are slowly being exposed by the

erosional forces of wind and water. As a result, recovery of scientific information from sites within the Area of Potential Effect reveals knowledge that would otherwise be lost.

Intact sites that are not currently subjected to erosive forces should be preserved for future generations. If all sites within the Area of Potential Effect were mitigated, then a case could be advanced for negative cumulative impacts to cultural resources. This is the case because archaeologists are continually identifying new issues about past human behavior, and new research methodologies are being advanced that may provide additional data about sites under investigation.

While some loss of archaeological values has occurred due to mining-related activities within the Area of Potential Effect from a cumulative perspective, this loss has been minimal. Reasonably foreseeable future actions include potential impacts to sites. However, the process in place mitigates direct and cumulative effects, which, leads to increased information regarding Nevada's cultural heritage.

NATIVE AMERICAN CONCERNS

In March 2007, BLM Elko District Office solicited input from local tribal entities for the Leeville and SOAPA Draft SEISs – Update to Cumulative Effects Analysis. Specifically, BLM stated "BLM wishes to gather information regarding specific tribal resources, sites, or activities that may have been missed by BLM and participating tribal groups and individuals, during the 2002 effort, or that have been identified or possibly impacted since 2002. Any new information provided will be used to update the cumulative effects analysis for these two authorized actions."

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for Native American Concerns includes the hydrographic basins identified on **Figure 3-5**. The rationale for the geographic area of cumulative effects is based on the importance of water sources to Newe/Western Shoshone traditionalists and land disturbance as it relates to loss of edible/medicinal plants, minerals, wildlife, potential loss of artifacts viewed as sacred objects and potential impacts to traditional/cultural/spiritual use sites and associated activities.

MONITORING DATA AND NEW INFORMATION

Past consultation with Tribal communities resulted in identification of two Traditional Cultural Properties in the vicinity of the Carlin Trend: 1) a location along Rock Creek; and 2) the Tosawihi Quarries.

BLM periodically contacts the various Tribes and Tribal representatives to solicit input to decisions made by BLM on internal and externally generated projects. Recent solicitation with Tribal members within the identified Study Area for Native American Concerns includes:

- Hollister Development Block Project 2002-2009: Underground exploration and proposed mining near Tosawihi Quarries Traditional Cultural Property (TCP) and Archaeological District;
- Esmeralda Fire 2005: Fire burned contributing element (Big Butte) of Tosawihi Quarries Traditional Cultural Property;
- Winters Fire 2006: Fire burned north of Tosawihi Quarries TCP and Archaeological District;
- Sheep Fire 2006: Fire burned near Rock Creek TCP;

- Ivanhoe/Buttercup Spring Protection (contributing element to Tosawihi Quarries TCP) – Exclosure - 2007: Supplemental to Barrick Betze Plan of Operations of 2003 – Dewatering Mitigation; and

- Barrick Expansion - (Betze Project) – 2007.

The following information was received from tribal coordination/communications for the projects noted above.

Tribal members are concerned about impact fires and fire suppression activities have had directly to artifacts and medicinal/edible plant species. According to the tribes, data gathering and excavation of sites, as mitigation, are not acceptable, unless artifacts are returned to the Shoshone people and Shoshone participate in the excavations or are able to observe the activities. However, BLM must curate them to the Nevada State Museum and, according to cultural resource laws; artifacts taken from BLM- administered land are considered the property of the federal government. Therefore, BLM "mitigating" sites via excavation and data gathering may be considered an adverse impact to tribal sacred sites and associated sacred objects (artifacts), when viewed from a traditional Western Shoshone perspective. Loan agreements can be negotiated if the requesting tribes have the facilities and expertise to house the artifacts. Tribally designated observers have been used in the past when data gathering is the only option for preserving artifacts.

Tribal members have provided input to the types of fire suppression tactics to be used when fires occur within or near the two identified Traditional Cultural Properties. They request that fires be allowed to burn naturally, as they have for thousands of years. Tribal members do not want heavy equipment disturbing sites and have stated that impacts to most artifacts (stone tools) by fire are quite minimal. Normal fire fighting techniques such as cutting fire line with hand tools, use of heavy equipment, and air tankers dropping red mud or "slurry" would cause more of an adverse impact than allowing fires to burn through.

Impacts to edible/medicinal plant populations, within the Study Area, are unknown as BLM does not regularly monitor these species nor do most BLM personnel know how to identify them. BLM relies on tribal members to determine the locations and document changes to such plant populations. In general, tribal members note a decline in the number of edible and medicinal plant species across northern Nevada. "Yompa" and "Doza" are particularly difficult to locate. Whether the Leeville Project has had an adverse impact is not known. Perhaps the greatest impact occurs via wildfire, drought, cheat grass invasion, and livestock grazing.

Water source health, especially those within or near the Traditional Cultural Properties areas, is a critical element in the maintenance of the spiritual integrity of those sacred sites. Western Shoshone have asked that they have an opportunity to participate in the design and creation of any spring or headwater protection projects within or near the identified Traditional Cultural Properties.

Mine development in the Study Area has removed native vegetation from approximately 33,500 acres of land since inception of large scale mining (see *Mine and Mineral Development* section in Chapter 2). An undetermined number of plants of Tribal concern have been affected by current mining. Similarly, wildfire has burned several thousand acres (see *Wildfires and Reseeding* section in Chapter 2) in and around the Study Area resulting in the loss of an undetermined amount of plants that are of importance to Tribe traditionalists. Livestock grazing continues to be a dominant land use that also likely affects many types of plants important to Tribal traditionalists.

Consultation with the various Tribal communities is described in the Leeville Project EIS (BLM 2002a) and SOAPA EIS (BLM 2002b). Consultations completed during preparation of the Leeville Project EIS identified the following concerns:

- Ground disturbance – impacts to spiritual energy and spirits, loss of edible and medicinal plants, and minerals used by traditionalists.
- Dewatering – Potential impacts to water sources and riparian areas from dewatering activities, medicinal/edible plant gathering, water spirits, and cleansing ceremonies (Tosawihi Quarry area springs and Rock Creek and associated springs – Traditional Cultural Properties).
- Artifacts – Powerful and sacred objects; artifacts used by traditionalists in healing practices; collection by looters and BLM approved data gathering of artifacts denies traditionalists the use of these powerful objects.
- Sage Grouse – Tribal participants noted that sage grouse populations appear to be decreasing (possibly due to fires and mining operations).
- Adequate water flow in Rock Creek.

CUMULATIVE EFFECTS

Located within the traditional territory of the Western Shoshone, the Study Area for Native American Concerns contains spiritual/traditional/cultural resources, sites and social practices that aid in maintaining and strengthening social, cultural and spiritual integrity. Recognized tribal entities with known interests in the Study Area are the Te-Moak Tribe of Western Shoshone and the four constituent Bands (Elko, Battle Mountain, Wells, and South Fork) and the Duck Valley Sho-Pai Tribes of Idaho and Nevada. Various community members and families from those tribes and bands have also identified themselves as belonging to the original Tosawihi Band of Shoshone (whose traditional territory generally lies north of Battle Mountain, to Golconda, Midas, Tuscarora, and Dunphy.

Some Western Shoshone have expressed a concern that cumulative effects may occur to their spiritual life and cosmology. Development of new projects that disturb stream flows, vegetation patterns, and wildlife distribution individually and collectively could impact the integrity of power spots, disrupt the flow of spiritual power (Puha), and cause the displacement of spirits (e.g., Little Men and Water Babies). Any such impact would limit potential for Western Shoshone to participate in traditional religious activities (BLM 2002b).

Contributing elements that assist in maintaining social and spiritual integrity include, but are not limited to: Existing antelope traps; certain mountain tops used for prayer, guidance, and reflection; medicinal and edible plant gathering locations; prehistoric and historic village sites and gravesites; sites associated with creation stories; hot and cold springs; material used for making baskets and cradle boards; locations of stone tools such as points and grinding stones (mono and matate); chert and obsidian quarries; hunting sites; sage grouse leks; sweat lodge locations; locations of pine nut ceremonies, traditional gathering, and camping sites; rocks or boulders used for offerings and medicine gathering; tribally identified Traditional Cultural Properties; Traditional Cultural Properties found to be eligible to the National Register of Historic Places; rock shelters; locations of "rock art"; land that is near, within, or bordering current reservation boundaries; land that conflicts with tribal acquisition efforts involving the Nevada Congressional Delegation; and water sources in general, which are often considered the "life blood of the Earth and all who dwell upon it."

Information concerning potential effects of mining including dewatering activities associated with mine operations and potential impacts to vegetation and sage grouse in the Study Area are contained in the *Water Quantity and Quality*, *Vegetation Resources*, and *Terrestrial Wildlife, T&E, Candidate, and Sensitive Species* sections of this chapter.

During the last 15 to 20 years, BLM and the Tribes have witnessed increased use of land, administered by BLM, by various groups, organizations, and individuals. Livestock grazing; recreation opportunities (e.g., hunting/fishing; oil, gas, geothermal, and mining exploration), along with relatively "newer" uses such as OHV use, mountain biking, equestrian, and interpretive trails are among many activities that are increasing within the BLM Elko District Office administrative boundary. In addition, existing growth and development uses of public land, mineral exploration, and extraction continues to contribute to the general decline of sites and associated activities of a cultural, traditional, and spiritual nature.

Archaeological sites and artifacts, including tribal resources and sites of cultural, traditional, spiritual use and associated activities are increasingly in danger of losing their physical and spiritual integrity. Use of public land administered by BLM is commensurate with the growth in population and the potential for decline of culturally sensitive areas. Different world views and social and spiritual practices and beliefs often conflict with each other. Because the traditional land of the Western Shoshone encompass most of Nevada including the Elko BLM District Office, BLM and affected Tribes must remain flexible and open to productive and proactive communication in order to assist each other in making decisions that will reduce or eliminate adverse affects to all parties and resources involved.

CHAPTER 4

CONSULTATION, COORDINATION, AND PARTICIPATION

PUBLIC PARTICIPATION SUMMARY

Public participation specific to this Final SEIS is summarized in this chapter. The summary indicates how the public has been involved, identifies persons and organizations contacted for feedback, and identifies the process BLM used in accomplishing goals in accordance with 40 CFR 1506.6.

Public involvement in the SEIS process includes the steps necessary to identify and address public concerns and needs. The public involvement process assists agencies in: (1) broadening the information base for decision making; (2) informing the public about Proposed Actions and potential long-term impacts that could result from the Projects; and (3) ensuring that public needs are understood by the agencies.

Opportunities for public participation in the preparation of this Final SEIS are provided at four specific points:

- **Scoping:** The public was provided a 21-day scoping period to disclose potential issues and concerns associated with the Cumulative Effects of the Leeville Project. Information obtained by the agencies during public scoping was combined with issues identified by the agencies and this forms the scope of the Draft SEIS.
- **Draft SEIS Review:** A 60-day Draft SEIS review period was initiated by publication of Notice of Availability for the Draft SEIS in the Federal Register.
- **Final Supplemental EIS/Record of Decision:** 30 days after publication of a Notice of Availability for the Final Supplemental EIS in the Federal Register, a Record of Decision will be issued.

IMPLEMENTATION

The public participation process for the Draft SEIS comprised the following four components:

1. PUBLIC SCOPING PERIOD AND MEETINGS

BLM filed a notice of intent (NOI) to prepare a Draft SEIS for the Leeville Project to update cumulative effects analysis. The NOI appeared in the Federal Register on March 7, 2007 (Volume 72, No. 44, page 10241). The NOI announced a 21-day public comment period ending March 29, 2007.

Scoping letters were mailed to individuals and organizations announcing the scoping period and describing the cumulative effects analysis process. Issues regarding the cumulative effects analysis identified by BLM also were included in the mailing.

Scoping comments were received from seven individuals and organizations. Concurrent with these actions, BLM issued a news release to local news organizations and radio stations with coverage in the surrounding geographical regions.

2. DISTRIBUTION OF DRAFT SEIS

The Draft SEIS was distributed as follows:

- A Notice of Availability was published in the Federal Register on August 31, 2007 specifying dates for the 60-day public comment period which ended October 31, 2007.
- A news release was provided to all area media by BLM at the beginning of the 60-day comment period on the Draft SEIS.
- The Draft EIS was distributed to interested parties that responded to a request from BLM Elko District Office during the scoping announcement.
- The Draft SEIS was posted on the BLM website.

3. DISTRIBUTION OF FINAL SEIS

This Final SEIS is distributed as follows:

- Notice of Availability is published in the Federal Register;
- Copies of the Final SEIS are sent to addresses on the Elko District Office mailing list;
- The Final SEIS is posted on the BLM website; and
- A news release issued to the same news outlets used for previous project announcements.

CRITERIA AND METHODS BY WHICH PUBLIC INPUT IS EVALUATED

Comments received by BLM on the Draft SEIS have been reviewed and evaluated by the agency to determine if information provided in the comments would require a formal response or contains new data that may identify deficiencies in the Supplemental EIS. Revisions have been made in the Final SEIS to address substantive comments received during the 60-day public comment period, as appropriate. In addition, the Final SEIS contains a *Response to Comments* section that provides responses to comments BLM received on the Draft SEIS.

CONSULTATION WITH OTHERS

The following state and federal agencies were consulted during preparation of the SEIS:

- Nevada Department of Conservation and Natural Resources
- Nevada Department of Human Resources
- Nevada State Clearinghouse

LIST OF PREPARERS AND REVIEWERS

BUREAU OF LAND MANAGEMENT

Core Interdisciplinary Team and Technical Specialty

Elko District Office Manager – Kenneth E. Miller
Tuscarora Field Office Manager, Elko District –Steve Dondero (acting)
Supplemental EIS Project Team Leader/NEPA – Deb McFarlane
Geology/Minerals/Hazardous Materials – Deb McFarlane
Surface Compliance – Janice Stadelman
Air Quality – Mark Dean, Deb McFarlane, Craig Nicholls, John Daniels, Scott Archer
Water Resources – Mark Dean
Soil – Mark Dean
Vegetation –Donna Jewell
Terrestrial Wildlife/Special Status Species – Ken Wilkinson
Wetlands, Aquatics, Fisheries/Special Status Species – Carol Evans
Recreation and Visual Resources – Tamara Hawthorne
Grazing Management/Range Resources – Donna Jewell
Access and Land Use – Cathie Jensen, Deb McFarlane
Cultural Resources – Bryan Hockett
Native American Religious Concerns – Gerald Dixon and Bryan Hockett
Social and Economic Resources – Deb McFarlane
Environmental Justice – Deb McFarlane

COOPERATING AGENCY

Nevada Department of Wildlife – Rory Lamp, wildlife biologist

THIRD PARTY EIS CONTRACTOR

AMEC Geomatrix, Inc.

Project Manager	Terry Grotbo NEPA Coordinator Helena, MT	BS Earth Science/Geology 30 years experience
Assistant Project Manager	Joe Murphy Helena, MT	BA Geography 35 years experience
Physical Sciences	Doug Rogness Helena, MT	B.S. Geology M.S. Hydrology 24 years experience
Water Resources	Doug Rogness Helena, MT	B.S. Geology M.S. Hydrology 24 years experience

Geology, Minerals, and Paleontology	Terry Grotbo Helena, MT	B.S. Earth Sciences Geology Major 30 years experience
Soil Resources	Judd Stark Billings, MT	B.S. Land Rehabilitation 10 years experience
Biological Sciences	Joe Elliott Missoula, MT	B.S. Biology and Chemistry Ph. D Botany 38 years experience
Social Sciences	Karen Lyncoln Roundup, MT	B.S. Economics 20 years experience
Social Economic Resources	Richard Leferink	B.S. Economics 20 years experience
Document Control	Lynne Green	24 years experience

MAILING LIST
LEEVILLE PROJECT

This document was mailed to approximately 100 agencies and individuals.

CHAPTER 5

RESPONSE TO COMMENTS

INTRODUCTION

This chapter contains copies of comment letters from federal, state, and local agencies and private organizations on the Draft Supplemental Environmental Impact Statement Leeville Project Cumulative Effects. A total of five letters were received during the 60-day comment period which ended on October 31, 2007.

This chapter also provides BLM's responses to substantive comments. Some responses direct the reader to sections of the Final SEIS that have been revised to address the comment.

The following is a list of letters received:

1. Humboldt River Basin Water Authority
2. Nevada State Historic Preservation Office
3. Nevada Division of State Lands
4. Great Basin Mine Watch
5. U.S. Environmental Protection Agency

Letter No. 1

Humboldt River Basin Water Authority
c/o P.O. Box 2008
Carson City, Nevada 89702

Elko County
Eureka County
Humboldt County
Lander County
Pershing County

October 28, 2007

Bureau of Land Management
Elko Field Office
Attention: SOAPA/Leeville Project SEIS Coordinator
3900 Idaho Street
Elko, Nevada 89801

RE: Comments to Draft Supplemental Impact Statements for Newmont Mining Corporation's South Operations Area Project amendment (SOAPA) and Leeville Project

To Whom It May Concern:

On behalf of the Humboldt River Basin Water Authority (HRBWA), I am please to submit the following comments to the Draft Supplemental Impact Statements for Newmont Mining Corporation's South Operations Area Project amendment (SOAPA) and Leeville Project. At the outset, let me note that HRBWA supports responsible mining on public lands within the Humboldt River Basin. Mining is a critical element to the region's natural resource dependent economy. The Authority encourages the Bureau of Land Management (BLM) to facilitate mining operations which effectively mitigate project impacts and provide significant contributions to the regional economy.

Page 3-25, 7th bullet (of both SEISs) – A reduction of base flow in the Humboldt River at Dunphy of 3.4 cfs represents a loss of 723.6125 acre-feet of available surface water otherwise available to downstream users in this fully adjudicated river system. At 3.5 acre-feet per acre, this is enough water to irrigate an estimated 207 acres of farmland. Over a 100-year possible recovery period, the loss of base flow in the Humboldt River could total more than 72,360 acre-feet of surface water. This total represents the direct impact to downstream water rights holders and would serve as the benchmark against feasibility of various mitigation measures might be considered. 1-1

Alternatively, the draft SEISs disclose, but fail to quantify, the extent to which mine related discharges to the Humboldt River will serve to augment base flows. A quantitative estimate of possible mine related increases in base flow should be provided in the final SEISs. Disclosure of the possible net change in base flow during and after mine dewatering should be included in the final SEISs. 1-2

Response 1-1: Comment noted. The maximum base flow reduction of 3.4 cubic feet per second (cfs), would occur in about 2040, with a long-term (100 years) decrease of about 0.9 cfs (HCI 2007a). Also see Response 1-2.

Response 1-2: The Final EIS for the South Operations Area Project (BLM 1993) and the Cumulative Impact Analysis (CIA) of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project (BLM 2000) describes the predicted base flow effects that could be attributed to mine dewatering and discharge to the Humboldt River system. As per the Ninth Circuit Court's Decision, the analysis of the cumulative impact to water was considered adequate in the 2002 FEIS (BLM 2002a) and CIA (BLM 2000). The intent of the water resources section of this Final SEIS is to update information since 2002. As stated in the SOAP Final EIS (BLM 1993), CIA (BLM 2000), and in the Final EIS for the Leeville Project (BLM 2002), Newmont has committed to augmenting low flows in the river using senior water rights that the company owns or controls. After cessation of mine dewatering discharges, Newmont will undertake a program to mitigate potential water losses to irrigation water rights holders in the middle and lower Humboldt River sub-basins. Prior to each irrigation season, Newmont will determine the acre-feet of water that might be lost during that season, based on the projected impacts to the Humboldt River base flow for that year. Newmont will work with the Water Master for the Humboldt River to administer a like amount of its senior water rights as if they were the most junior rights in the sub-basin for that irrigation season.

The draft SEISs fail to recognize that as a fully adjudicated system, all water in the Humboldt River is owned by someone. The draft SEISs fail to consider the economic consequence of the cumulative loss of base flow in the Humboldt River attributable to the various mining projects on the Carlin Trend. I-3

Potential Mitigation: Feasible measures to mitigate the loss in Humboldt River base flow resulting from mining on the Carlin Trend are not identified and analyzed in the draft SEISs. The final SEISs should describe feasible methods to mitigate impacts to water rights holders. All relevant, reasonable mitigation measures must be identified in the final SEISs. The Humboldt River Basin Water Authority is prepared to assist BLM in identifying such methods to mitigate impacts to base flows. The probability of the mitigation measures being implemented must also be discussed in the final SEISs. I-4

It is important to note that monitoring is not considered one of five methods recognized by the Council on Environmental Quality to mitigate impacts. Those five acceptable methods include avoiding, minimizing, rectifying, reducing and compensating (40CFR1508.20).
I trust these comments will serve to improve the Leeville Project as such may ultimately be approved by the BLM for development and operation.

Sincerely,

Benny Hodges
Chairman

cc: Board Members and Alternates, HRBWA

Response I-3: Section 8.0 – *Grazing Management* and Section 9.0 – *Socioeconomics* in the CIA (BLM 2000) identify the potential economic effects that could result from changes in base flow conditions in the Humboldt River as a result of mine dewatering and discharge.

Response I-4: See Response I-2.

JIM GIBBONS
Governor

STATE OF NEVADA

ANDREW K. CLINGER
Director

DEPARTMENT OF ADMINISTRATION
209 E. Musser Street, Room 200
Carson City, Nevada 89701-4298
(775) 684-0222
Fax (775) 684-0260
http://www.budget.state.nv.us/

October 30, 2007

Kenneth Miller
US Department of the Interior
Bureau of Land Management
Elko Field Office
3900 East Idaho Street
Elko, NV 89801-4611

Re: SAI NV # E2008-106 Reference: 1793.7/3809

Project: **Draft SEIS for the Loeville Project**

Dear Kenneth Miller:

Enclosed are comments from the agencies listed below regarding the above referenced document. Please address these comments or concerns in your final decision.

Division of State Lands

The following agencies support the above referenced document as written:

State Historic Preservation Office

This constitutes the State Clearinghouse review of this proposal as per Executive Order 12372. If you have questions, please contact me at (775) 684-0209.

Sincerely,

Krista Coulter
Nevada State Clearinghouse

Letter No. 2

Rebecca Palmer

From: Planning Section [Clearinghouse@budget.state.nv.us]
Sent: Wednesday, September 05, 2007 2:53 PM
To: Rebecca Palmer
Subject: E2008-106 Draft SEIS for the Leeville Project - Elko Field Office

NEVADA STATE CLEARINGHOUSE
Department of Administration, Budget and Planning Division
209 East Musser Street, Room 200, Carson City, Nevada 89701-4298
(775) 684-0209 Fax (775) 684-0260
DATE: September 5, 2007

RECEIVED
OCT 17 2007
DEPARTMENT OF ADMINISTRATION
OFFICE OF THE DIRECTOR
BUDGET AND PLANNING DIVISION

State Historic Preservation Office

Nevada SAI # E2008-106
Project: Draft SEIS for the Leeville Project

Follow the link below to download an Adobe PDF document concerning the above-mentioned project for your review and comment.

http://budget.state.nv.us/clearinghouse/Notice/2008/E2008-106.pdf

Please evaluate it with respect to its effect on your plans and programs; the importance of its contribution to state and/or local areawide goals and objectives; and its accord with any applicable laws, orders or regulations with which you are familiar.

Please submit your comments no later than Tuesday, October 23, 2007.

Use the space below for short comments. If significant comments are provided, please use agency letterhead and include the Nevada SAI number and comment due date for our reference. Questions? Gosia Sylwestrzak, (775) 684-0209 or mailto:clearinghouse@budget.state.nv.us.

Document will take time to load

___No comment on this project ✓ Proposal supported as written 2-1

AGENCY COMMENTS:

Signature: Rebecca L Palmer Date: 10/2/07

Distribution:
Sandy Emilici, Department of Conservation & Natural Resources Jeff Hardcastle, State Demographer Alan Di Stefano, Economic Development Kathy Dow, Economic Development Stan Marshall, State Health Division Sherry Rupert, Indian Commission Skip Canfield, AICP, Division of State Lands Michael J. Stewart, Legislative Counsel Bureau Alan Coyner, Commission on Minerals D. Driesner, Commission on Minerals Christy Morris, Commission on Minerals John Walker, Nevada Division of Environmental Protection Jim Shabi, Nevada Dept. of Employment, Training and Rehabilitation, Research and Analysis Pete Anderson, Division of Forestry Mike Dondero, Division of Forestry Rich Harvey, Division of Forestry Catherine Cuccaro, Department of Transportation Anthony Grossman, Department of Wildlife, Director's Office Steve Foree, Department of Wildlife, Elko Robert Martinez, Division of Water Resources James D. Morefield, Natural Heritage Program Steve Weaver, Division of State Parks Mark Harris, PE, Public Utilities Commission Pete Konesky, State Energy Office Rebecca Palmer, State Historic Preservation Office John Muntean, UNR Bureau of Mines Jon Price, UNR Bureau of Mines Russ Land, Nevada Division of Environmental Protection Gosia Sylwestrzak, zzClearinghouse Reese Tietje, zzClearinghouse -Reese Maud Naroll, zzClearinghouse-Maud Gosia Sylwestrzak, zzClearinghouse -Gosia

Response 2-1: Comment noted.

Letter No. 3

Follow up

Planning Section

From: Skip Canfield **Sent:** Tue 9/11/2007 4:34 PM
To: Planning Section
Cc:
Subject: RE: E2008-106 Draft SEIS for the Leeville Project - Elko Field Office
Attachments:

The Nevada Division of State Lands provides the following comments:

There is a concern about the cumulative visual impacts to public lands users' experiences.

Although one project might seem insignificant, and even those that are only temporary, in the big picture, as we employ the multiple use concepts of our public lands, please consider a comprehensive and consistent look at visual impacts and how very small and inexpensive mitigation measures can play a large role in the compatibility of the built and natural environment.

1. Utilize consistent lighting mitigation measures that follow "Dark Sky" lighting practices. Please see www.darksky.org. Dark sky measures are inexpensive, simple to implement, and very mainstream. The result is a less obtrusive impact to other users of adjacent public lands. 3-1

Effective lighting should have screens that do not allow the bulb to shine up or out. In fact, lighting that is installed using dark sky fixtures (light is only aimed at the subject property) is more efficient, safer, and results in reduced electricity costs.

2. Utilize consistent mitigation measures that address logical placement of improvements and use of appropriate screening and structure colors. Existing utility corridors, roads and areas of disturbed land should be utilized wherever possible.

--A good example is the use of a paint color called "sudan brown" for water tanks and other vertical structures. Using screening, careful site placement, and cognitive use of earth-tone colors/materials that match the environment go a long way to improve the user experience for others who might have different values than what is fostered by built environment activities.

Skip Canfield, AICP
State Land Use Planning Agency

-----Original Message-----
From: Planning Section
Sent: Wednesday, September 05, 2007 2:51 PM
To: Skip Canfield
Subject: E2008-106 Draft SEIS for the Leeville Project - Elko Field Office

NEVADA STATE CLEARINGHOUSE
Department of Administration, Budget and Planning Division
209 East Musser Street, Room 200, Carson City, Nevada 89701-4298
(775) 684-0209 Fax (775) 684-0260
DATE: September 5, 2007

Division of State Lands

Nevada SAI # E2008-106

Response 3-1: Visual impacts associated with the Leeville Project were analyzed using procedures set forth in the Visual Contrast Rating Handbook (BLM 1986). The project meets Visual Resource Management objectives for Class IV which allows the greatest degree of modification of the landscape by management activities.

Text in the *Visual Resources* section of Chapter 3 has been revised to address cumulative effects of night lighting.

Project: Draft SEIS for the Leeville Project

Follow the link below to download an Adobe PDF document concerning the above-mentioned project for your review and comment.

http://budget.state.nv.us/clearinghouse/Notice/2008/E2008-106.pdf

Please evaluate it with respect to its effect on your plans and programs; the importance of its contribution to state and/or local

areawide goals and objectives; and its accord with any applicable laws, orders or regulations with which you are familiar.

Please submit your comments no later than Tuesday, October 23, 2007.

Use the space below for short comments. If significant comments are provided, please use agency letterhead and include the Nevada SAI number and comment due date for our reference. Questions? Gosia Sylwestrzak, (775) 684-0209 or mailto:clearinghouse@budget.state.nv.us.

Document will take time to load

____No comment on this project ____Proposal supported as written

AGENCY COMMENTS:

Signature: Date:

Distribution:
Sandy Quilici, Department of Conservation & Natural Resources
Jeff Hardcastle, State Demographer
Alan Di Stefano, Economic Development
Kathy Dow, Economic Development
Stan Marshall, State Health Division
Sherry Rupert, Indian Commission
Skip Canfield, AICP, Division of State Lands
Michael J. Stewart, Legislative Counsel Bureau
Alan Coyner, Commission on Minerals
D. Driesner, Commission on Minerals
Christy Morris, Commission on Minerals
John Walker, Nevada Division of Environmental Protection
Jim Shabi, Nevada Dept. of Employment, Training and Rehabilitation, Research and Analysis
Pete Anderson, Division of Forestry
Mike Dondero, Division of Forestry
Rich Harvey, Division of Forestry
Catherine Cuccaro, Department of Transportation
Anthony Grossman, Department of Wildlife, Director's Office
Steve Foree, Department of Wildlife, Elko
Robert Martinez, Division of Water Resources
James D. Morefield, Natural Heritage Program

Letter No. 4

Great Basin Mine Watch

85 Keystone Ave., Suite K
Reno, NV 89503
775-348-1986
info@greatbasinminewatch.org
www.greatbasinminewatch.org

November 1, 2007

Bureau of Land Management
Elko field Office
Attention: Leeville Project SEIS Coordinator
3900 Idaho St.
Elko, NV 89801

RE: Draft Supplemental Environmental Impact Statement for Leeville Project.

Dear Project Coordinator,

Please find our comments of the Draft Supplemental Environmental Impact Statement (DSEIS) for Leeville Project prepared by Tom Meyers for Great Basin Mine Watch. We have reviewed and fully accept these comments.

According to our review there are a number of inadequacies in the DSEIS, which are addressed specifically within the detailed comments. The concerns noted below regarding water resources, groundwater modeling, agriculture, and air quality should be corrected. The groundwater model should be recalibrated and new predictions made for the final SEIS. 4-1

One additional comment we will include here is the limitation of the cumulative impact boundary contained in the DSEIS. Great Basin Mine Watch for the record still does not agree that the impacts of the project end at the boundaries generally shown in figures in the SDEIS. We refer you to our comments during scoping that we stand by: 4-2

"In the original EISs for the projects, the BLM defined the cumulative impact study area as the Carlin Trend, and therefore did not consider mines such as the Pipeline, Marigold or Phoenix Project.[1] *We strongly urge the BLM to* ***not*** *again draw an imaginary line as the study area boundary, but to rather use boundaries appropriate to the particular resource or value and the level of disturbance to that resource and the natural boundaries of impact for the resource.*

[1] Final Environmental Impact Statement Newmont Mining Corporation's South Operations Area Project Amendment (SOAPA FEIS) Appendix E; pg 40.

Response 4-1: BLM completed the Draft SEIS in accordance with instructions received from the Ninth Circuit Court directing BLM to address the adequacy of cumulative effects analysis for resources in the vicinity of the mine project. The court concluded that the CIA (BLM 2000) comprehensively evaluated cumulative effects associated with mine dewatering and discharge.

BLM has provided updated water quality and quantity information obtained since compilation of the CIA and initiation of the SOAPA and Leeville Projects to the present time in the Draft and Final SEIS documents.

The numerical groundwater model was recalibrated and updated in March 2007 by Hydrologic Consultants Inc. (HCI 2007a). The results of that recalibration and update are discussed in the *Water Quantity* section of the Leeville Final SEIS.

Response 4-2: The cumulative effects Study Area for each resource are determined on a case by case basis. BLM defined the Carlin Trend as the cumulative effects analysis area for most resources or resource uses and considers it a reasonable Study Area for purposes of this cumulative effects assessment associated with development of the SOAPA and Leeville projects. Detailed descriptions and rationale used to develop individual resource cumulative effects Study Areas are provided in the respective sections of Chapter 3 in this Final SEIS. The Pipeline, Marigold, and Phoenix projects were determined to not contribute additive effects on resources present and affected in the vicinity of the SOAPA and Leeville projects.

For all surface water impacts, the whole Humboldt River drainage must be considered. To arbitrarily assume the impacts of the SOAPA and Leeville projects' pumping water into Maggie Creek will not either exacerbate or lessen the impacts of the Lone Tree pit lake formation on the Humboldt River, as an example, is not defensible. In a similar manner, any salts or metals added to the river by SOAPA/Leeville, will have a cumulative impact with any salts added by any other mines, or power plants, in the drainage.

4-3

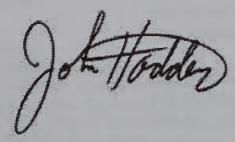
For many resources the study area should encompass the area of northern Nevada with the high number of large mines. The BLM map "Northern Nevada Mines" (14 November 2006) can serve as a guide. The area from the Jerritt Canyon mine in the northeast, to the Sleeper mine in the northwest, to the Standard and Coeur Rochester mines in the southwest, to the Yankee mine in the southeast, should be used for many resources."

4-4

- Great Basin Mine Watch, March 27, 2007 Scoping Comments for Supplemental EIS's for SOAPA and Leeville Projects.

We hope that the BLM will reexamine the cumulative impacts boundary as part of the FEIS.

Sincerely,



John Hadder
Staff Scientist

Response 4-3: Cumulative effects of dewatering were addressed in the CIA (BLM 2000). The following description is an update on the status of the Lone Tree Mine:

Dewatering at the Lone Tree Mine ended on December 20, 2006. Since then, the Lone Tree Mine pit has been filling with water and by mid-March 2008, the pit lake was 410 feet deep. The pit lake is 48 percent full by elevation and 33 percent full by volume. The Lone Tree pit lake currently contains approximately 1,600 acre-feet of water and when full, the pit lake will contain 4,750 acre-feet and be 875 feet deep at its deepest point.

Groundwater elevation monitoring in the area of the mine reflects filling of the Lone Tree Mine pit lake. The deeper bedrock aquifer has recovered a similar amount (about 400 feet) while the shallower alluvial aquifer(s) have either continued to decline or have remained stable since dewatering stopped. Measured aquifer responses to the cessation of dewatering are consistent with those predicted by Newmont's numeric groundwater model. Groundwater levels in shallow alluvial system adjacent to the Humboldt River remain unaffected by past dewatering and pit lake filling because of a ubiquitous clay layer that isolates the shallow alluvial aquifer and Humboldt River from the underlying alluvial aquifers.

Projected inorganic constituent load from mine dewatering projects to the Humboldt River is described in Section 3.3.8 of the CIA (BLM 2000) beginning on page 3-88.

The TS Power Plant is a zero discharge facility. All process water is reused and evaporated.

Response 4-4: See Response 4-2.

Review of Draft Supplemental Environmental Impact Statement, Leeville Project Cumulative Effects

October 17, 2007

Prepared for:

Great Basin Mine Watch
Reno, NV

By

Tom Myers, Ph.D.
Hydrologic Consultant

Introduction

This report is a review of the Draft Supplemental Environmental Impact Statement for the Leeville Project Cumulative Effects analysis (SEIS). The SEIS analyzing cumulative effects of mining on the Carlin Trend was required as a result of litigation filed by Great Basin Mine Watch. This report focuses on water resources, air quality, and waste rock issues.

The SEIS incorporates the original DEIS documents by reference. Therefore, the Great Basin Mine Watch comments on the original DEIS and FEIS are also incorporated by reference. It included substantial comments on the groundwater modeling in the area.

The SEIS lists the Emigrant project and an expansion of Betze/Post as the only reasonably foreseeable new mining on the Carlin Trend. It also discusses the TS Ranch Coal-Fired Power Plant being constructed by a Newmont subsidiary.

Waste Rock

Mining removes and relocates vast quantities of rock as part of the quest for minerals (SEIS, p. 3-1). The waste rock ends up in heap leach pads, tailings impoundments and waste rock dumps. A primary issue with the movement of waste rock is the potential for meteoric water to leach and release to the environment trace metals. For this reason, the SEIS should include a table showing the cumulative area and tonnage of waste rock, tailings and heaps for all of the mines in the area. The table should also note the amount of PAG waste at each facility and include the cumulative amount of metals stored based on TRI. Table 3-1 is a start, but is insufficient. 4-5

Additionally, Table 3-1 cannot be correct. The Genesis/Lantern mine cannot have created the largest total amount of waste rock. The amount of waste at Gold Quarry cannot be as low as indicated. Several mines are missing from the table; these include at least Rain, Meikle and 4-6

Response 4-5: The "cumulative area" disturbed by mining in the portion of the Carlin Trend that has been determined to contribute additive impacts to resources affected by the SOAPA and Leeville projects is described in **Table 2-1** of this Final SEIS. The volume of potentially acid generating (PAG) waste rock at each facility producing PAG waste rock is included in **Table 3-1**.

As described in the Draft and Final SEISs, various methods for managing PAG waste rock have been and continue to be employed throughout mining operations in the Carlin Trend. These methods include: blending PAG rock with non-PAG rock; encapsulation of PAG rock with non-PAG rock; contouring and regrading waste rock disposal facilities to limit infiltration of precipitation; being placed as in-pit backfill below predicted groundwater elevations at the end of mining and dewatering activities; and construction of capping systems that efficiently store and release (via evapotranspiration) precipitation to limit the volume of water available for infiltration into and through the waste rock. Waste rock disposal facilities within the Carlin Trend are monitored for stability, trace metal release, and revegetation (reclamation). All waste rock disposal facilities are subject to BLM and NDEP reclamation requirements, which the agencies consider when calculating the reclamation cost estimate for the financial guarantee covering the operations. BLM and NDEP monitor performance of individual waste rock disposal facilities in meeting closure requirements (including release of trace metals to the environment) and will not release any financial guarantee until BLM and NDEP determine, along with all agencies with jurisdiction, that the operator has successfully completed reclamation according to the terms of its plan of operations.

Waste rock disposal sites are no longer reported under TRI requirements based on the *de minimus* exemption.. On April 2, 2003, the federal District Court for the District of Columbia ruled that EPA had improperly required metals mining operations to report low concentrations of metals and metal compounds occurring naturally in the rock moved and stored during these operations. Under the ruling, these low concentrations are not reportable under TRI. (The exclusion applies to a listed material present in a mixture at levels below 1%, or 0.1% if the material is a carcinogen.)

Response 4-6: Table 3-1 has been revised per comment.

Waste rock production from the Meikle Mine is placed in the existing waste rock disposal facility associated with the Betze/Post Mine operation. **Table 3-1** (see Chapter 3 in this Final SEIS) has been updated to reflect revised volumes of waste rock deposition in the Carlin Trend. Volume of waste rock identified for the Genesis Project includes reasonably foreseeable future mine expansion.

Hollister. It is also difficult to believe that only one year of data if available at Betze/Post; it has been reporting waste rock amounts to NDEP for years. 4-6 (contd)

Supplementing the table, there should be a map showing the location of the individual facilities. If possible the map should locate the PAG waste to aid in identification of potential future hot spots, defined as areas where seepage could release AMD to the environment. The SEIS could talk about mitigation strategies with respect to PAG waste, such as mixing with neutralizing rock or encapsulation, but it should not rely on these mitigations to assume there can never be any seepage of AMD. The efficacy of the mitigation depends on release rates and the extent of mixing, not just the mass of net neutralizing material. 4-7

The document does not discuss the ongoing seepage from the James Creek tailings impoundment. The final SEIS should do so. 4-8

Also, the document should discuss the failure of the waste dump at Gold Quarry. 4-9

Grazing and Agriculture

The SEIS indicates that grazing will continue during and after mining without substantial changes. Currently, agriculture is booming in Boulder Flat because the irrigation pivots are being used to dispose of dewatering water. However, the agriculture will not continue once the TS Power Plant is completed and mine dewatering ceases because the water rights for that plant are not temporary dewatering rights but are the agricultural rights that were converted to mining and milling (for the use of dewatering water for irrigation; this was done by changing the point of diversion to the dewatering wells). The point of use for some of the certificated water rights has since been changed to the power plant. Thus, the power plant will use water rights that had previously been for agriculture. An example is the conversion of water rights permit 30241 (certificate 10047) to permit 71424. This conversion was a change in the point of diversion to the Goldstrike Mine with an intended use of industrial for power production. The permit was then amended with application 76015, which is currently listed as ready for action. 4-10

These changes in water rights are for changes from agriculture to industrial. The agricultural economy in the basin will therefore change as the dewatering ceases and more water is diverted to the power plant. Because it is part of the reasonably foreseeable future actions, this DEIS should discuss the changes in the economy to be expected due to the loss of agriculture.

Air Quality

The assessment of before and after annual concentrations of PM_{10} may be misleading. One reason is that 1997-2002 is not really a pre-mine period. SOAP commenced operations more than a decade previous to the commencement of data collection. It may have been dormant, but there were still exposed areas from which particulate matter could discharge. For this reason, the claim that there has been no effect of mining on PM_{10} air quality may not be correct. 4-11

There is no monitoring at the mines for gaseous pollutants (SEIS, p. 3-9), therefore it is not possible to assess whether gaseous emissions could be problem. It is not appropriate to state that "[i]t is uncommon for gaseous pollutants to be detected in the vicinity of mining operations" (SEIS, p. 3-9) without any reference. 4-12

Response 4-7: See Response 4-5 and **Figure 2-1.**

Response 4-8: In 1990, the presence of WAD cyanide and elevated TDS in downgradient monitoring wells indicated that process solution from the James Creek Tailing Storage Facility was leaking into groundwater. A remediation plan was implemented and pump-back wells were installed and operated until 1996. At that time, water quality data from monitoring wells located within, and downgradient of, the remediation area reported values below MCL limits for the affected groundwater. This was in part due to cessation of regular operation of the James Creek Tailing Storage Facility and, in part, due to successful pump-back of the contaminated groundwater. However, regular groundwater quality monitoring and reporting continued for all wells. In November 2001, NDEP-BMRR approved an EDC to abandon several remediation pump-back wells and water quality monitoring wells required by the remediation plan due to continued water quality result that met NDEP-BMRR Profile I reference standards. The reporting requirement was also modified to become part of the regular annual reporting in accordance with the Water Pollution Control Permit (NEV0090056). Quarter sampling of four water quality monitoring wells continues and two pump-back wells are operationally maintained in the event they are needed.

Response 4-9: On February 5, 2005, a portion of Newmont's Gold Quarry North Waste Rock Facility (NWRF) collapsed, with some displaced material crossing Nevada State Route 766. The toe of the collapse moved about 600 feet and stopped before reaching Maggie Creek, northeast of the highway. At the time of failure the NWRF was 420 feet high, with an overall slope of 2.9H to 1.0V (19 degrees). Approximately 10 million tons of material was displaced and the event is referred to as the Gold Quarry Slide.

Call and Nicholas, Inc. (CNI), a geotechnical consulting firm, investigated the cause of the Gold Quarry Slide. An Oversight Panel was convened by NDEP to provided direction and oversight for the investigation. The investigation followed a scientific study plan developed by CNI and was endorsed by the Panel and NDEP. The investigation process included site investigations, evaluation of potential causes, monitoring, sampling, and data analysis, and geotechnical modeling.

The NWRF was constructed in a series of layers or lifts beginning in the 1980's. The lower three lifts are comprised of soil-like material removed during mining. This material, from a portion of the Carlin Formation is predominantly fine-grained clayey silt. The upper layer of the NWRF consists of waste rock.

The investigation determined that the Gold Quarry Slide occurred because the shear strength (the ability of material to withstand strain) of the lower tuffaceous portion of the Carlin Formation in the lower layers of the NWRF was not adequate for the constructed slope height and angle. The shear strength of the material decreased after being placed in the NWRF. Pore water pressures (contained water) may have had some influence but even if there were no excess pore pressures, the failure would have eventually resulted because of the inadequate shear strength of the soil material.

The long-term stability plan for the NWRF includes removal and relocation of waste rock, recontouring the area of the failure, constructing a buttress below portions of the NWRF slope, 'flattening' and recontouring other portions of the NWRF, reclaiming disturbed areas, and continuing geotechnical monitoring of the entire facility.

Response 4-10: The scale of livestock grazing operations in Boulder Valley is not dependent on water from mine dewatering, nor connected to the former agricultural water rights now changed for industrial use for the TS Power Plant. Irrigation water right points of diversion were not changed to any dewatering wells.

The TS Power Plant water rights were changed from irrigation to industrial, but did not involve any mining and milling use, the manner of use of portions of existing irrigation water rights at Mack Creek Farm was changed directly to industrial, and points of diversion were initially changed by applications 71424-71436 to proposed well sites around the proposed TS Power Plant. Further design required the proposed points of diversion be amended and moved to four sets of potential water sources including well sites at the TS Power Plant, existing pivot water supply wells at the old Boulder Creek Fields (the wells and some of the pivots there pre-exist mine dewatering), existing wells at Mack Creek Farm, and injection wells-- not dewatering or mining/milling supply wells-- owned by Barrick Goldstrike Mines, Inc. at the northern end of Boulder Valley (these would have been refitted as dedicated water supply wells for the TS Power Plant). The Mack Creek Farm and Boulder Creek Fields applications were withdrawn. Permits 71431 and 71434 for the TS Power Plant site points of diversion were issued, but with very restricted diversion limits. Permits 71424, 71428-30, and 71432 were issued for the injection wells, but the idea to use them as supply wells proved unworkable.

Applications 76012-17 were then filed to change points of diversion from Barrick's injection wells to two proposed supply wells for the TS Power Plant. Applications 76018-19 were filed to adjust allocations at the on-site wells and to correct the point of diversion of the completed backup supply well. Applications 76012-76019 were all issued November 30, 2007.

The Mack Creek Farm agricultural base rights changed for the TS Power Plant were selected because they were not involved in substitution of use for mine dewatering. No water rights transferred to the TS Power Plant were connected to substitution of use by mine dewatering,

The TS Power Plant water rights transfers have no foreseeable effect on future agriculture in Boulder Valley.

Response 4-11: Data presented in the Draft and Final SEISs incorporates PM_{10} data collected since 1997 (which predates construction of SOAPA and Leeville projects). PM_{10} data prior to 1997 are not available for these project areas. Since that time, no major increases in PM_{10} concentrations have been recorded, and values remain within State of Nevada and National Ambient Air Quality Standards.

Response 4-12: Monitoring of gaseous emissions is not required under air quality permits required for mines in the Study Area; the text has been revised. For most mining operations, the air pollutant of potential concern is particulate matter. While there may be some gaseous pollutants emitted by heavy equipment operating at a mine, it is unlike a power plant, pulp mill, or smelter. Gaseous pollutants at mining operations do not have the minimum volume of emissions of these pollutants that require monitoring. Cumulative effects modeling of PM_{10}, NOx, SOx, and CO was conducted using the three regulated sources of these emissions within the Carlin Trend. Results of this modeling exercise are described in the *Air Quality* section of Chapter 3 in this Final SEIS.

The failure to analyze $PM_{2.5}$ is unacceptable. The claim that "[m]etallic mineral processing produces few $PM_{2.5}$ emission, as primary fine particle emissions typically are produced from sources such as diesel engines, wood burning activities, and other industrial and commercial combustion processes" (SEIS, p. 3-12) may be correct, but applying it to these mines requires the BLM to ignore the diesel engine trucks and other excavating equipment. This equipment operates continuously at the mines. Their emissions should be considered in this analysis. Accepting NDEP's determination that "meeting the PM_{10} standards and control measures serves as a surrogate approach for controlling $PM_{2.5}$ emissions and protecting air quality" (*Id.*) is not an excuse for not analyzing the impacts. Impacts occur whether a regulation is violated or whether a bureaucratic agency determines the activity is within the letter of the law. Future regulation may come about due to analysis showing an impact. Accepting NDEP's assumptions is circular reasoning wherein it assumed that one activity takes care of the problem so that no monitoring is necessary to verify the assumption's veracity or to identify other sources. PM_{10} control measures differ from the measures that would be used for $PM_{2.5}$.

4-13

The SEIS relies on an air quality model that incorporates meteorological data and emissions based on EPA published factors. Calibration apparently relies on topographic input and textbook parameters, such as dispersion. EPA has approved the model (Id.) but it is used herein apparently without verifying the input, the emissions from the sources, and without calibrating the parameters such as dispersion. The model input should be verified with measurements at the various sources; the factors used by EPA are averages and if the emissions at these mines lie above the mean or are outliers the emissions could be grossly higher than modeled and BLM would not know it. Calibration should include adjusting model parameters so that predicted concentrations at receptors equals the observed values, if any are collected.

4-14

The air quality analysis is based on model calculations at various receptors, defined as "the locations at which the model was directed to calculate concentrations" (SEIS, p. 3-12). The receptors were established using a 1000-meter spaced grid. It would be useful to have a figure showing the distribution of the receptors. There is no actual data collected to verify the predictions from the model. The model calibration is thus accepted without any indication of whether it accurately predicts PM_{10} concentrations.

4-15

It may be common practice to utilize this model without data to calibrate it, but the resulting predictions should not be considered anything but educated guesses. It would be like running the MODFLOW program, a widely accepted modeling code, to predict impacts on groundwater without any calibration beyond accepting textbook hydrologic properties.

Water Resources

The SEIS updates previous analysis of groundwater resources and the impacts of mine dewatering. Impacts on water resources are very important; this section focuses on various water resources concepts including artificial recharge, perennial yield, modeling predictions and reality, and the estimate of natural recharge in the area.

Response 4-13: See revised Air Quality section in this Final SEIS.

Response 4-14: Use of published emission factors to estimate emissions is common practice. The USEPA published the Compilation of Air Pollutant Emission Factors (Document AP-42) specifically to allow this process as it would be difficult to measure all emission sources at a facility.

The reviewer suggests that modeling was done without "calibrating the dispersion." This response assumes the reviewer believes model results should be compared to actual measured concentrations. This suggestion would be inconsistent with USEPA guidance. Air quality models are not "calibrated." Model codes used in the modeling analysis were verified or validated in complex studies (EPA, 2008. *AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources* - http://www.epa.gov/ttn/chief/ap42/index.html).

The air quality model used in the current analysis is a widely-used program mandated in 40 CFR Part 51, Appendix W; Guideline on Air Quality Models. Calibrating AQ models is deemed "unacceptable" in regulatory modeling per Section 8.2.9.

Response 4-15: Figure 3-2 showing receptor locations has been added to the text. See also Response 4-12.

Artificial Recharge

The following statement from the SEIS is very misleading:

> Not all groundwater pumped for mine dewatering is lost to the water balance of the affected hydrologic basins because a percentage of the pumped water is reinfiltrated. Over 50 percent of pumped groundwater typically is infiltrated for the Betze and Leeville mines, with less than 10 percent of pumped groundwater being subject to infiltration from the Gold Quarry Mine. (SEIS, p. 3-2)

Recharging dewatering water may technically keep the water within a basin but it creates new discharges and significant deficits at scales of less than the full basin.

Reinfiltration and excessive irrigation creates a mound in the basin fill aquifer. Mounding increases the gradient driving seepage to nearby streams and decreases the depth to groundwater. The SEIS indicates the mound is as much as 55 feet. The mounds in Boulder Flat have increased seepage from Boulder Flat to the Humboldt River; this seepage will increase as the mound slowly migrates southwestward. The mound also keeps the water table closer to the ground surface which increases groundwater evapotranspiration (ET). Figure 3-4 in the SEIS shows the dominant vegetation in Boulder Flat is greasewood and salt desert shrub. Nichols (1992) found a significant relationship between the depth to groundwater and evapotranspiration from greasewood. The groundwater model assumptions (HCI 2000) include the fact that ET becomes a maximum when the groundwater table reaches the ground surface. Therefore, the discharge from the groundwater in the basin fill has increased, probably substantially, from its pre-mining conditions due to the recharge of and irrigation with dewatering water.

4-16

The BLM should account for these new groundwater discharges before it claims that reinfiltration is keeping all or most of the dewatering water in the basin; the statement from the SEIS above should be revised to reflect the increased discharge from the system.

The artificial recharge of dewatering water may not be available to fill the deficit being created because the recharge is to the basin fill aquifer but the dewatering depletes bedrock aquifers, either carbonate or siltstone. If there is not a substantial contact between aquifers, this is potentially a major problem. The carbonate aquifer supports substantial interbasin flow downgradient from the basins and discharge to the Humboldt River. Prudic et al (1995) found approximately 35000 af/y of discharge to phreatophytes and the Humboldt River in the reach between Elko and Palisade. The drawdown caused by dewatering may divert some of the discharge from the Humboldt River to fill the deficit.

It is also of questionable appropriateness to consider leaks from the TS Reservoir and Maggie Creek Reservoir as a reinfiltration project (SEIS, p. 3-22). These reservoirs were not designed as reinfiltration basins.

Perennial Yield

The perennial yield of a groundwater basin is the amount of water which can be economically pumped annually without causing a permanently increasing drawdown. Usually it equals the discharge from the basin including evapotranspiration and streamflow plus interbasin groundwater

4-17

Response 4-16: The Leeville Infiltration Project permit (NEV2002105) for treatment and management of dewatering water associated with the Leeville Project (NEV90056) was issued by NDEP-BMRR on April 28, 2005. A discharge pipeline system conveys treated dewatering water to Barrick Goldstrike Mines Boulder Valley Recirculation Project facilities (NEV95114) for subsequent infiltration in the TS Ranch Reservoir. The Leeville infiltration permit limits for discharge water quality meet or exceed Barrick's permit requirements. Referring to the TS Ranch Reservoir as a re-infiltration project is appropriate and permitted under State law.

Pumping from the deeper carbonate/siltstone bedrock aquifer system creates a deficit within the deeper bedrock system. To the extent that the bedrock system is in communication with shallower basin fill groundwater systems, either within specific tributary basins or the Humboldt River itself, there may be a change in groundwater flow regimes at specific points along the collective flow paths of the basin fill and bedrock aquifer systems. The percentage of bedrock aquifer system water lost to evaporation and/or evapotranspiration is minimal compared to the total volume of groundwater.

The Hadley fields are flood irrigated during the growing season from about mid-April to mid-October. As is standard practice at the Nevada Division of Water Resources (H. Ricci, NDWR, personal communication, 1995), 30 percent of the water delivered to the irrigation system was assumed to recharge the ground-water system. The irrigation rate was determined by Newmont's monthly records of water distribution from the Gold Quarry dewatering system (HCI 2007).

Groundwater monitoring near Maggie Creek Reservoir has documented an increase (mounding) in groundwater elevation since water was placed in the reservoir. While not designed or operated as an infiltration project, some water in the reservoir does infiltrate into the ground. This is a normal consequence of reservoir operation because the natural materials that underlay the reservoir are not completely impermeable. Groundwater modeling (HCI 2007) determined the vertical hydraulic conductivity of the Carlin Formation on which the reservoir is constructed, ranges from 0.003 to 0.5 ft/day while the horizontal conductivity ranges from 0.05 to 0.5 ft/day. These conductivities allow reservoir water to infiltrate to the groundwater table and form a groundwater mound.

Response 4-17: Section 3.2.7 – "Impacts to the Regional Water Balance" in the CIA report (BLM 2000) provides modeled results of changes in groundwater flow as a result of dewatering and discharge for three primary drainages associated with the Carlin Trend area. These drainages include Boulder Creek, Maggie Creek, and Rock Creek. Modeling has accounted for all major groundwater deficits including drawdown cone-of-depression, pit lake volume, pit lake evaporation, groundwater mounding/recharge, and crop evaporation. Predicted timeframes provided in these model results indicate a specific recovery period for each of the hydrographic basins; these predicted recovery timeframes account for recovery of "deficits" created by the dewatering and discharge of water associated with mine development. Model results account for "perennial yield" of each basin as a component of recharge affected by the groundwater cone-of-depression during dewatering and recovery.

flow from the basin. The total perennial yield for the six groundwater basins around the mines (Susie, Maggie Cr, Marys Cr, Willow Cr, Boulder Flat and Rock Creek) totals 38,800 af/y with Boulder Flat accounting for 30,000 af/y and Maggie and Susie Creek basins combined equaling 6000 af/y. Independent recharge estimates are much less than the perennial yield estimates (Flint et al 2004), therefore the perennial yield needs to be supported by substantial interbasin flow.

Dewatering has far exceeded and will continue to exceed the cumulative perennial yield. The dewatering pumpage of 2,000,000 af, if correct, will total approximately 51 years of the entire perennial yield for the six basins. The deficit above the perennial yield will be approximately 950,000 af. Total pumpage to date is 1,135,000 af which equals 37 years of the perennial yield in the basin and is a deficit of 595,000 af or about 20 years of the perennial yield. Pumpage from 1992 to 2007 has totaled about three times that which would be allowed by the Nevada State Engineer if he followed Nevada water law of approving water rights applications up to the perennial yield of a basin.

The source of water to fill the deficit being created on the Carlin Trend is a major problem. When mining ceases, there will be several open pits with groundwater drawdown as much as 1900 feet around them; the pits will fill with water. The drawdown cone volume is effectively the volume of water that has been removed from the system. The difference between the volume of the pits and the amount of water that would have been stored in the pore spaces of the pit volume is an additional deficit which must be filled. **4-17 (contd)**

The SEIS should account for of all the groundwater deficits being created, including drawdown cone and pit lake volume. It should also include in the accounting the actual volume of the mound being created by recharge including an accounting for the additional discharge caused by the mound. The SEIS should then consider how many years of the perennial yield will be tied up making up the deficit.

Model Predictions and Reality

Much of the analysis has been done by updating the groundwater model used in the 2000 cumulative impacts analysis (CIA). It is good that the BLM has updated the model. The updated model was not reviewed for this analysis. However, the SEIS should present up-to-date drawdown maps for the study area. The maps should show drawdown in the Carlin, Vinini and carbonate formations. Predicted drawdown from 2000 should also be shown. This would allow the reader to assess the quality of the original model. This is known as verification. Had this been done, the BLM would have seen the discrepancies discussed below where the current drawdown exceeds the predicted maximum extent of drawdown. The suggested map would also allow the BLM to assess better where additional monitoring may be required to assess the propagation of stress to the northeast. **4-18**

The SEIS presents only very cursory results from the up-to-date model. These are primarily limited to a comparison of the maximum extent of the 10-foot drawdown between the CIA prediction and the current prediction. It shows a significant contraction of the ten-foot drawdown area in three locations and states that "the maximum extent of the predicted 10-ft drawdown isopleth due to all Carlin Trend dewatering will be smaller than those predicted previously for environmental assessments in the Carlin Trend" (SEIS page 3-24). However, one location where the model shows a decrease in the ten-foot drawdown extent contradicts the observed data. Two other areas of **4-19**

Response 4-18: The 2007 model update completed by Hydrologic Consultants, Inc (HCI 2007a) was conducted using the same model structure used since 1992, with the exception of adding mounding at Maggie Creek Reservoir and irrigation associated with the Hadley area. The Carlin Trend model is updated and recalibrated every 2 years (most recent update was completed in March 2007). An up-to-date drawdown map has been provided as **Figure 3-5** of this Final SEIS which represents the cumulative or additive drawdown from multiple pumping areas within the Carlin Trend. Calibration conducted on the Carlin Trend model every 2 years has resulted in validation of the model. The following is excerpted from the 2007 Update to the Carlin Trend Numerical Groundwater Model (HCI 2007a):

2.3.4 Steady-State Calibration

Since the only change to the steady-state Carlin Trend model was the finer discretization in the Leeville area, the steady-state calibration did not change from the 2004 Carlin Trend model (HCI, 2005). For completeness, however, the steady-state calibration is presented in this report. It is the same as the steady-state calibration presented in HCI (2005).The 2007 steady-state calibration was evaluated by producing a quality plot using the 161 measured water levels throughout the HSA (Figure 4). On a quality plot, each point represents the measured water level (horizontal axis) and model-predicted water level (vertical axis) at a monitoring location. One measure of the ability of the model to replicate steady-state water levels can be made by fitting a line through the resulting data set. Ideally, a best-fit line would produce a slope close to unity, would pass through the origin, and would also have a correlation coefficient (or R^2) close to 1.0. The calculated best-fit line for the steady-state simulation of the Carlin Trend model had a slope of 1.0 and a corresponding $R^2 = 0.99$. The measured and computed data for the steady-state calibration are contained in Table 3. Plate I shows the spatial distribution of the residual between the measured and computed heads.

Three methods that are often cited (Anderson and Woessner, 1992) to assess the "accuracy" of a model are the mean error (ME), the mean absolute error (MAE), and the root mean squared error (RMS). All three of these methods are ways of expressing the average difference between computed and measured heads. Statistical analyses of the measured and calibrated water levels using the ME, MAE, RMS and standard deviation are presented in Table 4. The ME, MAE, RMS, and standard deviation are 3.1, 30.9, 46.6, and 46.5 ft, respectively. The difference between the highest and lowest measured water levels in the HSA is more than 2,200 ft, and the absolute value of the highest residual is 172.9 ft or about 7.8 percent of the range of measured heads.

2.3.5 Transient Calibration

A transient simulation was conducted to evaluate the changes in water levels in the ground-water system calculated by the model in response to historic pumping, injection, infiltration, and irrigation using data obtained from NMC and Barrick for the period of 1988 through December 2006. There were no new hydrogeologic interpretations to add to the transient model, and the model calibration remained satisfactory even with more than two years of additional water level data (i.e., from August 2004 to December 2006) added to the transient calibration plots. This indicates the "maturity" of the Carlin Trend ground-water flow model. Therefore, the numerical model was not changed, other than adding recharge from the Maggie Creek reservoir and Hadley fields.

Data from 198 monitoring wells were used to evaluate the transient calibration. The monitoring well locations are shown on Plate II. Hydrographs showing the calibrated and measured water levels for the selected wells are presented in Appendix A. These wells were selected on the basis of their spatial distribution, the hydrostratigraphic unit into which they were completed, and the amounts of water level data that were available for comparison to model calculated values.

Overall, the transient model calibration is conservative in that it either matches or over predicts drawdown relative to measured values. The predictive capabilities of a ground-water model can be assessed by the use of hydrographs. The potential hydrologic effects in the HSA are a function of declines in regional ground-water levels resulting from mine dewatering and pit lake infilling. Consequently, the "accuracy" of the predictions of the model depends more on the ability of the model to predict water level changes produced by the mining activities than its ability to replicate a series of pre-stress water levels at one point in time. Total reliance on the ME, MAE, and RMS as the only measures of model calibration fails to address the predictive capabilities of the model. Visual examination of the hydrographs presented in Appendix A provides another way of assessing the predictive capabilities of the ground-water model.

Response 4-19: See Response 4-18 for information about the up-to-date model and predicted areas where the drawdown would change. Modeled drawdown areas shown on **Figure 3-5** in this Final SEIS are for the water table aquifer, which includes several geologic units over the Study Area, including carbonate, sandstone, siltstone, siliciclastic, and volcanic rocks. As further discussed in Responses 4-17 and 4-18, observed drawdown is consistent with model predictions.

decreased drawdown have occurred in an area where there is no data. The conclusions in the SEIS regarding less drawdown are dubious. These problems are discussed in the next paragraphs.

4-19 (contd)

Figure 3-2 presents the ten-foot drawdown cones from the two models (2000 and 2007). The report does not indicate in what formation, or model layer this modeled drawdown will occur , so it is more difficult to assess.

The first contradiction in the model results is west and southwest of Carlin. The 2000 model indicated that the ten-foot drawdown would include most of the Marys Creek area while the 2007 model indicates the boundary has moved north about three miles. Three wells in the Marys Creek basin, six miles south of the mine site near the Humboldt River, contradict this change and indicate the model was inappropriately updated. The wells provide monitoring data (Newmont 2006) for the alluvium, siltstone and carbonate aquifers (Figure 1). The alluvial well, PAL4 varies as would be expected with wet/dry cycles on the Humboldt River. The siltstone well, PAL1, screened 300 feet BGS and 280 feet below PAL4, may show about a 2 foot drop with time, although the seasonal variation is of the same order of magnitude as the potential trend. The recovery in 2005/2006 may reflect the higher runoff of that period. The water levels are about 5 feet higher than those in the alluvial well which reflects a significant upward gradient between these points. If the recovery in PAL1 is due to high flow, the recharge most likely occurs upstream and not at the site. Well PAL3a, 1000 feet deep in carbonates, shows a definite trend with time, dropping about 5 feet since 1993. It experienced a temporary recovery during 2005/006 but the last two reported water levels were the lowest in the period of record.

Figure 1: Hydrographs of wells in the Mary's Creek basin.

4-20

Response: 4-20: The 10-ft isopleths on **Figure 3-5** depict the maximum area of potential drawdown greater than 10 feet in the upper most layer of the groundwater model (Layer 1). PAL-4 is completed within this layer. As pointed out in this comment, no drawdown has been measured in PAL-4 (Layer 1). PAL-1, also with no measured drawdown from dewatering, is completed within Layer 2 of the groundwater model. PAL-3a is completed within Layer 5. The slow, gradual reduction in water elevation recorded in this piezometer is caused by dewatering at Gold Quarry. The groundwater model reproduces (calibrates to) all three piezometers water level histories, including the small drawdown detected in PAL-3a. The ability of the groundwater model to reproduce these water levels supports the currently projected 10-foot isopleth in this area.

Based on the Marys Creek Basin wells, drawdown is extending southwest of the mine to near the Humboldt River, at least in the carbonate aquifer. It may not have yet reached ten feet, but the u: of these wells in the recalibration of the model should have resulted in the model predicting drawdown in this basin. That the current modeling actually predicts a contraction of the drawdown prediction raises questions about how the model was recalibrated and verified.

4-20 (contd)

The second area of concern is north of Leeville. The revised 10-foot drawdown prediction is about 15 miles closer to Leeville than in the 2000 model. The primary concern with this is the lack of data to support either location. Plume (2005) shows the 100-foot drawdown cone extends about 8 miles north into the Maggie Creek area. But the location is indeterminate because there are no wells with data to assess the location. Plate 6a of the Maggie Creek Basin Monitoring Plan (Newmont 2006) shows a similar location for the 100-foot drawdown. Either of these locations for the drawdown contradicts both the 2000 and 2007 predicted 10-foot drawdown which is drawn just north of the SOAPA area in the SEIS. The fact that the current 100-foot drawdown extends several miles beyond the point of the 10-foot modeled drawdown suggests the model is wrong.

4-21

Well HDP-12 also contradicts the models. It monitors groundwater level just west of the Tuscarora fault, in the Tuscarora Mountains about ten miles northeast of Leeville. As shown on Plate 6a of Newmont (2006), the drawdown there is 29 feet, but this is northeast of the extent of the 10-foot drawdown in the models. This is an additional indication the model is wrong northeast of Gold Quarry Mine.

Northeast of Gold Quarry three wells monitor groundwater levels – HW-1D, HW-1S, and EIS-MW3. Water levels in both HW-1D and HW-1S, lying about 4 miles from the pit, have experienced about a 150 foot drawdown since 1992 (Figure 2).

4-22

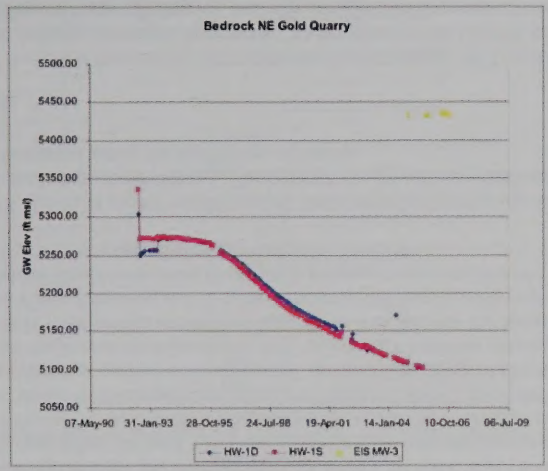


Figure 2: Hydrographs of wells northeast of Gold Quarry mine in the south end of the Independence Range.

Response 4-21: Both Plume (2005) and Plate 6a in the Maggie Creek Basin Monitoring Plan depict groundwater elevation changes in the bedrock aquifers (Paleozoic carbonates and siltstones) while the 10-ft isopleths on **Figure 3-5** are for aquifers located near the surface (model layer 1). Layer 1, depending on location, includes basin fill rocks including Quaternary alluvium, Carlin Formation (Tertiary), volcanic rocks, and locally the Paleozoic bedrock units. Plume points out that water level declines in carbonate rocks near Gold Quarry have not affected water levels in overlying basin-fill deposits because the older basin-fill deposits at the base of the Carlin Formation consist of fine-grained poorly permeable sediments. The modeled 10-ft isopleth northeast of Gold Quarry (along Maggie Creek) is within Carlin Formation sediment and is consistent with observed data for this area.

HDP-12 is screened 2,400 feet below the ground surface within upper plate Ordovician Vinini cherty and siliceous mudstones (model Layer 3). The groundwater model replicates the 29 feet of drawdown at this depth below the surface but predicts less than 10 feet of drawdown at the surface (Layer 1).

Response 4-22: The water resources monitoring program is reviewed and modified, as needed, with input from the BLM.

The CIA report (BLM 2000) evaluated the likelihood of predicted drawdown within the 10-ft isopleth actually affecting springs, seeps and surface water in the Independence Range northeast of Gold Quarry. Spring systems within the cumulative drawdown area were "separated into two distinct types based on elevation: 1) higher elevation springs, seeps, and spring-fed steams supported by perched or localized aquifers such that there is not a saturated continuity between the shallow ground water system and the deeper, more regionally extensive aquifer system; and 2) lower elevation springs, seeps, and perennial streams that are potentially influenced in part by flow from a deeper, regionally extensive aquifer system." This analysis defined the "transition between the two perennial source types occurs at an elevation of approximately 6,000 feet."

This comment suggests the need to expand groundwater monitoring into the Independence Range at elevations greater than 6,000 feet where potential impacts to surface water is not expected. BLM has considered the need for additional groundwater monitoring in this area; monitor well EISMW-3 was required in the SOAPA New Mitigation Measures (BLM 2002) and that mitigation plan has identified a 'contingency well' east of EISMW-3 if water levels "decline by 20 feet in any given year, or by an absolute decline of 50 feet." No measurable drawdown has been observed in EISMW-3 since installation. Additional groundwater monitoring in this area is not warranted at this time.

It took about two years, from 1992 to 1994, for stresses to propagate to these monitoring wells. Since then there has been a continuously increasing drawdown. HW-1D is in carbonate rock and HW-1S is in Vinini sandstone above the carbonate (Figure 3). The water levels change in parallel to each other indicating a good connection between the lower portion of the Vinini sandstone and the underlying carbonate rock. An additional well, EIS-MW3 was installed in 2005 about four miles further from the pit. It has not experienced any drawdown since its construction (Figure 2). It also is in the Vinini sandstone (Figure 4).

Water levels in EIS-MW3 are about 180 feet higher than the first measurements in the other wells (Figure 2), not counting the high first observations which were the static water level upon construction. This may reflect the well's location higher in the mountains nearer a zone of recharge; contours drawn for the before-development state would show a ridge coinciding with the topographic ridge. Based on the completion diagrams (Figures 3 and 4), the water level in HW-1S represents the potentiometric surface several hundred feet below the level of EIS-MW3. Considering the rate the drawdown expanded in HW-1s and –d, it could be causing drawdown at levels below EIS-MW3 that remain undetected in the well. The fact that the completion diagram indicates silt in the Vinini formation at HD-1d also indicates the deeper wells could be in a leaky confined aquifer which would both cause the stress to propagate more quickly and temporarily protect the upper layers from experiencing the additional drawdown.

4-22 (contd)

As part of the SEIS, the BLM should require a much more extensive monitoring network northeast of Gold Quarry in the Independence Range. The network should include additional wells in upper and lower Vinini formation and in the underlying carbonate.

Recharge Estimates

Another aspect of the model has recently been determined to be wrong. HCI used the Maxey-Eakin method to estimate recharge, however, incorrectly. As described by HCI (1998, p. 29-31), they used the Maxey-Eakin recharge efficiencies, but with precipitation determined from local stations. Recently, the Nevada State Engineer ruled that the Maxey-Eakin method applies only when used with the Hardman precipitation map. This is because the method is essentially a statistical relationship that was developed by comparing estimated discharge from 13 basins with precipitation estimates determined with the Hardman map. It could be that the Hardman map underestimated precipitation. If Maxey and Eakin had access to more current higher precipitation estimates, the recharge efficiencies would have been set lower so as to result in the same discharge (discharge had been estimated independent from the precipitation).

4-23

This is important because higher precipitation estimates result in unrealistically high recharge estimates. In order to adequately calibrate the model, parameters are set to run more water through the system than would be the case if the correct recharge had been used (correct based on a proper use of Maxey-Eakin). It also allows the groundwater deficits to recover faster and minimizes the modeled effect of dewatering on discharge to streams and springs.

Response 4-23: Maxey-Eakin (1949) was properly applied to estimate recharge for the groundwater model. BLM is unaware of any decision by the Nevada State Engineer that re-writes Maxey-Eakin. Jeton, Watkins, Lopes and Huntington (USGS 2005) evaluated the Oregon Climate Service's computer program which estimates precipitation in Nevada, which is called the Parameter-elevation Regressions on Independent Slopes Model, or PRISM. Jeton *et al.* conclude that "...for watershed-scale studies, developing basin-specific precipitation-elevation relations from representative climate stations (ideally in or near the study basin) may be more appropriate" than using PRISM. The State Engineers office does not encourage the use of PRISM to calculate precipitation and recommends either using basin-specific precipitation data or, if those data are not available, the Hardman map.

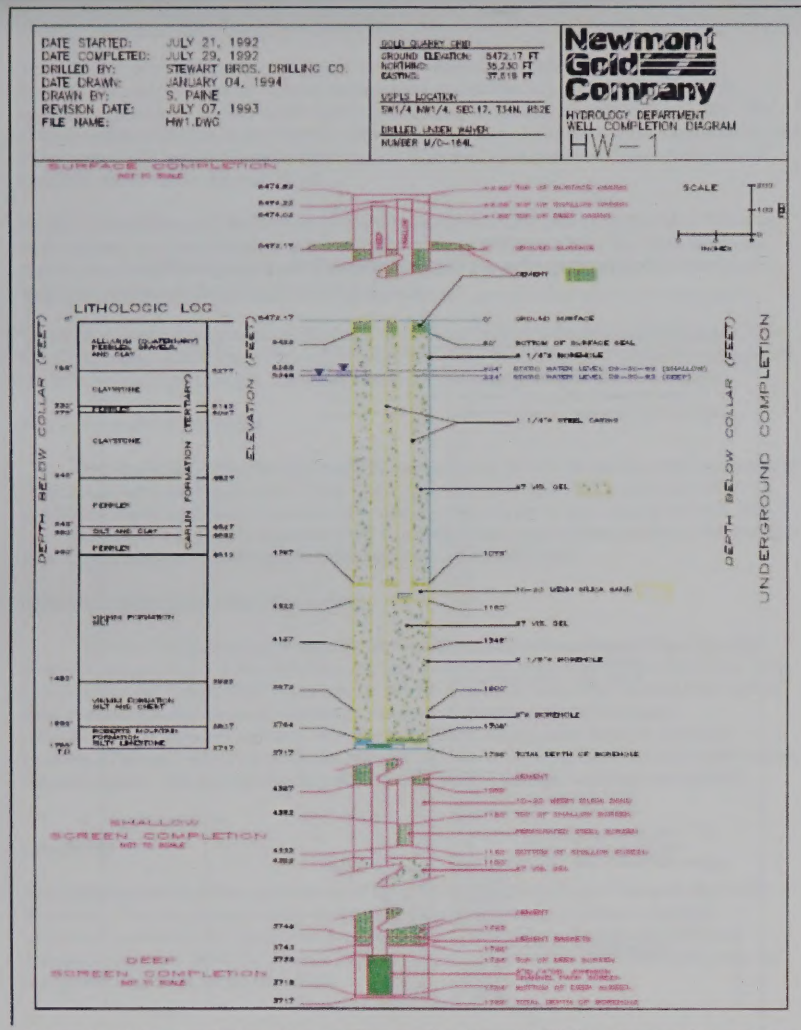


Figure 3: Well completion diagram for monitoring well HW-1 showing the multiple connection.

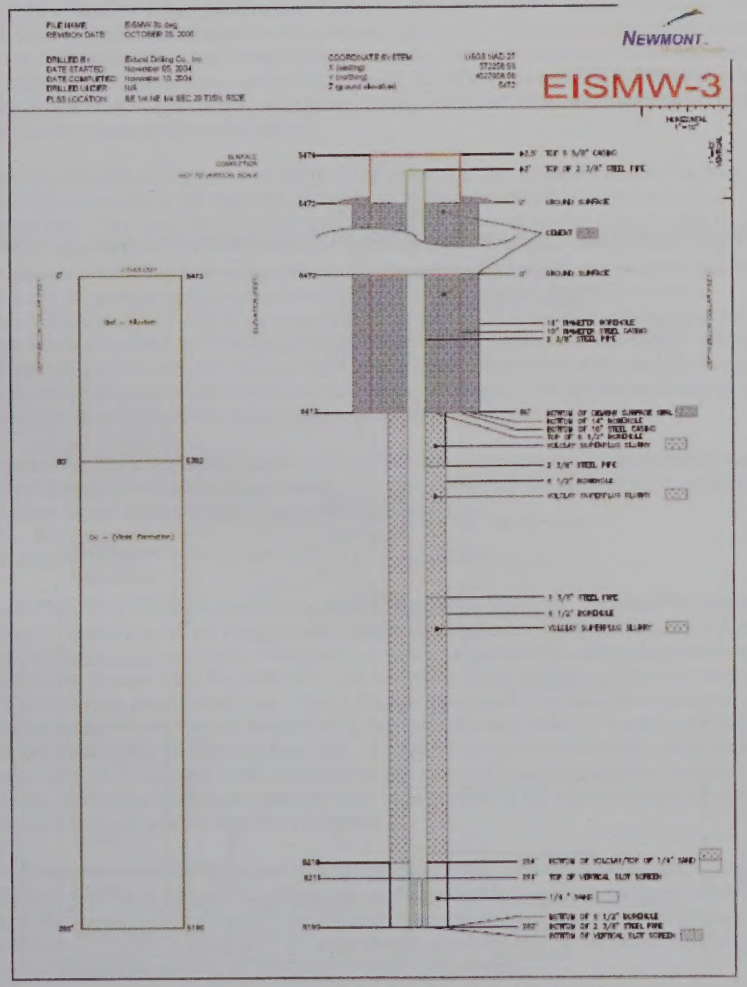


Figure 4: Well completion diagram for well EISMW-3.

General Comments Regarding Water Resources

The SEIS list many mitigation projects and the EIS which caused their implementation. Many of these projects include riparian enhancement and monitoring. The 2003 Betze SEIS apparently conveyed 1.5 cfs of water rights to NDOW for instream flow use (SEIS p. 2-16). The SEIS should describe this in more detail. What was the source of the water rights, their priority, and which stream will have the instream flow rights? Were the rights converted from one a different beneficial use to that of instream flow? 4-24

Barrick's Betze/Post and Meikle mine dewatering averages 20,000 gpm or 32,200 af/y. This may be the current rate, but certainly is not a long-term average (SEIS p. 2-20). The SEIS should not pretend the current rate resembles the past. There should a complete summary of dewatering for each mine and cumulatively for the entire study area. 4-25

The SEIS should include a table of discharges to the river from each facility, including Lone Tree. The BLM should include Lone Tree and measure any losses from the river that are occurring due to the filling of the Lone Tree pit. The BLM should include seepage runs in this investigation. 4-26

Federal Reserved Water Rights

The Draft SEIS fails, like the first FEIS, to adequately review the nature, extent and scope of federal reserved water rights under Public Water Reserve # 107. BLM has a duty under FLPMA and federal law to manage all operations to protect the flows in the waters covered by PWR 107 (e.g., springs and waterholes), and under NEPA to review the extent of these rights and the impacts from mine operations (including dewatering) on these waters and rights. 4-27

Additional Mining and Other Operations

The Draft SEIS does not provide the detailed and quantitative analysis of all of the other mining operations listed in the cumulative impacts tables in the original Draft and Final EISs. This is required by the Ninth Circuit's decision. A full and detailed review of the impacts from each of these mines on the environment, including air and water resources, Native American religious/cultural resources and uses, fisheries and wildlife, among other impacts, should be reviewed. The same is true for other past, present and reasonably foreseeable future actions such as the power plant. Although briefly discussed, the full impacts from that plant are not detailed. 4-28

Conclusion

The SEIS does not meet the requirements of a cumulative effects analysis of issues in the Carlin Trend area. The concerns noted above regarding water resources, groundwater modeling, agriculture, and air quality should be corrected. The BLM should also include the additional discussion requested above for the final SEIS. The groundwater model should be recalibrated and new predictions made for the final SEIS. 4-29

Response 4-24: The source of the water right is Barrick Goldstrike Mines, Inc. – Application No. 71517 with a priority date of 01/01/1886; the right applies to Rock Creek.

Response 4-25: The CIA report (BLM 2000) includes an evaluation of past, present, and future mine discharges in the Carlin Trend including the Betze-Post and Meikle Mines. Additional information is included Section 3.2 – *Impacts from Mine Dewatering and Localized Water Management Activities* (BLM 2000). The most recent groundwater model update report by HCI (2007a) includes graphs of past and predicted dewatering rates for the Gold Quarry and Leeville mines.

Response 4-26: An analysis of existing and projected mine dewatering and discharge rates throughout the Humboldt River basin was compiled in the CIA (BLM 2000). Updates to water resource conditions in the Carlin Trend were completed as a result of recalibration of the numeric groundwater model (HCI 2007a) used to predict impacts to water resources in the Carlin Trend in the Draft SEIS. BLM has determined that information provided in the CIA, including pumping rates, discharge rates, and predicted effects on the Humboldt River, along with the "2007 Update of Carlin Trend Numerical Ground-Water Flow Model" (HCI 2007a), remain valid for purposes of this Final SEIS analysis. See also Response 4-3 and 4-25 above.

Response 4-27: Public Water Reserves covering four springs in the cumulative effects study area are located outside the area of predicted groundwater drawdown and are not expected to be affected by mine dewatering activities. Only seeps and springs that have sufficient flow to be important for stockwatering and domestic use qualify as public water reserves under the 1926 Executive Order, and the reservation applies to only that amount of water necessary to fulfill the purpose of the reservation – namely, to prevent monopolization of springs and waterholes on public land needed for stockwatering or domestic purposes. *United States vs. City and County of Denver*, 656 P.2d 1 (Colo. 1982); *Purposes of Executive Order of April 17, 1926, Establishing Public Water Reserve No. 107, 90 I.D.81 (1983)*. The United States has filed claims for PWR's under the 1926 Executive Order on four springs occurring within the study area. None of those springs are projected to be incrementally impacted by mine dewatering at Leeville. The SOAPA EIS (BLM 2002b) identified 5 seeps or springs that may be incrementally impacted by dewatering at SOAPA. As explained in the SOAPA Final SEIS, none of those five seeps or springs would qualify as a PWR 107 water right, since four of them are situated on private land, and water rights for the fifth spring predate the 1926 Executive Order establishing PWR 107 rights. Consequently, Leeville will not have any cumulative impact on PWR 107 water rights.

The Leeville Final EIS (BLM 2002a) identified 40 springs and seeps located within the previously approved drawdown area. However, groundwater drawdown predicted for Leeville would occur within the cumulative cone of depression created by dewatering at SOAPA and Barrick's Betze/Post Mine. Comprehensive groundwater and spring/seep monitoring data document that none of those springs or seeps have been impacted by mine dewatering. Moreover, pursuant to approved mitigation plans, Newmont is required to monitor groundwater levels in sensitive areas to provide advance notice of potential impacts to those seeps and springs, which will allow for mitigation measures to be implemented in advance of any effect on flows. Specifically, in the event the flow of springs or seeps on public land is impacted, Newmont is required to take action "to replace any stockwater loss caused by mine dewatering."

Response 4-28: The comment suggests incorrectly that the SEIS does not provide a sufficiently detailed discussion of mining operations or other past, present, and reasonably foreseeable actions within the study areas, such as the TS Power Plant. The purpose of the SEIS is to provide an updated and expanded examination of the potential cumulative impacts of the Leeville Project. The Council on Environmental Quality's regulations define a "cumulative impact" as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7). Accordingly, the SEIS contains a sufficiently detailed discussion of other past, present and reasonably foreseeable actions within the study areas to allow BLM to evaluate the interaction between the impacts of those activities and the Leeville Project. In doing so, the SEIS provides a detailed summary of the past, present and reasonably foreseeable activities within the various cumulative impact study areas, and examines, on a resource-by-resource basis, the potential incremental impacts of the Leeville Project when added to the impacts from those other actions.

Response 4-29: The Carlin Trend model has been recalibrated and updated results are presented in this Final SEIS and in the report "2007 Update of Carlin Trend Numerical Ground-Water Flow Model" (HCI 2007a). BLM completed the Draft and Final SEISs in accordance with the Ninth Circuit Court's decision.

References

Bureau of Land Management (BLM), 2000. Cumulative Impact Analysis of Dewater and Water Management Operations for the Betze Project, south Operations Area Project Amendment, and Leeville Project. April, 2000. U.S. Bureau of Land Management, Elko, NV

Flint, A.L., L.E. Flint, J.A. Hevesi, and J.B. Blainey, 2004. Fundamental concepts of recharge in the Desert Southwest: A regional modeling perspective, p. 159- 184 in Hogan, J.F., F.M. Phillips, and B.R. Scanlon (ed.), Groundwater recharge in a desert environment: the southwestern United States. American Geophysical Union, Washington DC.

Newmont, 2006. Maggie Creek Basin Monitoring Plan 2nd. Quarter of 2006 and 3rd. Quarter of 2006

Plume, R.W., 2005. Changes in Ground-Water Levels in the Carlin Trend Area, North-Central Nevada, 1989 – 2003, Scientific Investigations Report 2005-5075. U.S. Geological Survey.

Prudic, D.E., J.R. Harrill, and T.J. Burbey, 1995. Conceptual Evaluation of Regional Ground-Water Flow in the Carbonate-Rock Province of the Great Basin, Nevada, Utah, and Adjacent States. U.S. Geological Survey Professional Paper 1409-D. Washington.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

November 9, 2007

Kenneth Miller
Bureau of Land Management
Elko Field Office
3900 East Idaho Street
Elko, NV 89801-0611

Subject: Leeville Project Cumulative Effects Draft Supplemental Environmental Impact Statement (SEIS) [CEQ #20070369]

Dear Mr. Miller:

The U.S. Environmental Protection Agency (EPA) has reviewed the above referenced document. Our review and comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's (CEQ) NEPA Implementation Regulations at 40 CFR 1500-1508, and our NEPA review authority under Section 309 of the Clean Air Act.

The Bureau of Land Management (BLM) published the Leeville Project Cumulative Effects Draft Supplemental Environmental Impact Statement (SEIS) in response to a decision by the U.S. Court of Appeals for the Ninth Circuit: Great Basin Mine Watch v. Hankins, 456 F.3d 955, 9th Circuit 2006. The Court required BLM to prepare a Supplemental EIS to adequately address the cumulative impacts for the Leeville project, which was analyzed in a Draft EIS in 2000 and a Final EIS in 2002. BLM signed the Record of Decision for the project in 2002. The project has been operating throughout the law suit.

In our comments on the Leeville Final EIS, we expressed concerns regarding the project's potential impacts to water quality based on uncertainties related to the mine's geochemistry. We recommended that commitments to additional mitigation and monitoring be made in the Record of Decision (ROD), including establishment of a long-term post-closure trust fund at the start of the project, if it was anticipated to be necessary.

We have rated the Leeville Project Draft SEIS as EC-2 (see enclosed "Summary of Rating Definitions and Follow-Up Action"). Our rating on this document is based on our continuing environmental concerns about the Leeville project because of its potential significant adverse impacts to water quality. We do not believe the project includes sufficient measures to ensure against acid rock drainage. Neither the original

EIS nor the Draft SEIS contains sufficient information to confirm that the acid neutralization potential of the Leeville waste rock is adequate to prevent acid generation and ensure against adverse impacts to water quality over the long term. We recommend that the Final SEIS provide additional information regarding mine geochemistry, measures to prevent acid drainage, mercury emissions and controls, and bonding and long-term financial assurance. Our detailed comments are enclosed. Our recommendations are consistent with our previous comments on the Final EIS. While we understand that this project has been ongoing for several years, this SEIS provides an opportunity for reevaluation of, and adjustments to, some project components to ensure protection of environmental resources, both during mine operation and after mine closure.

We appreciate the opportunity to review this Draft SEIS and look forward to working with BLM to identify solutions to the concerns we have raised. We request a copy of the Final SEIS when it is filed with our Washington, D.C. office. If you have any questions, please call me at (415) 972-3846, or have your staff call Jeanne Geselbracht at (415) 972-3853.

Sincerely,

Nova Blazej, Manager
Environmental Review Office

002912
Enclosure

Cc: David Gaskin, Nevada Division of Environmental Protection
Paul Pettit, Newmont Mining Corporation
Damien Higgins, U.S. Fish and Wildlife Service

Leeville Project Draft Supplemental Environmental Impact Statement

Mine Geochemistry and Waste Rock Management

EPA continues to have concerns that the acid-base accounting upon which the Leeville project Plan of Operation (POO) is based may underestimate the amount of potentially acid generating (PAG) waste rock at the mine. The estimated percentage of PAG waste rock for the Leeville mine in Table 3-1 of the Draft Supplemental Environmental Impact Statement (SEIS) is also inconsistent with the Final EIS (p. 3-6). As we stated in our previous comments on the Draft and Final EISs, we believe Newmont's procedure for compositing all the rock for each rock type or formation under-represents the total amount of PAG waste rock from different areas within given rock types or geologic formations. One-third of the waste rock samples which were composited and for which acid-base accounting was conducted indicated an acid neutralizing potential to acid generating potential (ANP:AGP) ratio of less than 3:1 and low net neutralizing potentials. In addition, it is our understanding that the PAG waste rock estimates are based on Newmont's Net Carbonate Value (NCV) testing, which does not account for some uncertainties and may also lead to an underestimation of the potential for acid generation. It does not appear, however, that any kinetic tests were conducted to better characterize the waste rock. 5-1

We are also concerned because the Draft SEIS (p. 3-3) states that waste rock generated at the mine is classified in accordance with Nevada Division of Environmental Protection (NDEP) Waste Rock and Overburden Evaluation Guidelines (1996). NDEP classifies PAG waste rock with an ANP:AGP ratio of 1.2:1 or higher as non-PAG rock. This reference is inconsistent with BLM Nevada's Instruction Memorandum No. NV-97-017, which defines samples with an ANP:AGP ratio between 1.0 and 3.0, or a net neutralizing potential between -20 and +20 tons $CaCO_3$ per kiloton rock material, as having an uncertain acid generation potential, and recommends kinetic tests be conducted on samples within this range to better determine potential to generate acid. If only waste rock with an ANP:AGP ratio equal to or less than 1.2:1 is classified and disposed as PAG rock without confirmation by kinetic testing, it is possible that some waste rock is being misclassified and improperly disposed. 5-2

Recommendation: We recommend that BLM reevaluate the geochemistry for this mine, including procedures for ensuring representativeness in determining ANP:AGP ratios and the amounts of PAG and neutralizing waste rock at the Leeville site. The Final SEIS should provide a description of this evaluation, supporting it with detailed geochemistry information. We recommend BLM require kinetic testing for waste rock with ANP:AGP ratios between 1:1 and 3:1 to better characterize this portion of the waste rock and help determine how it should be properly disposed. If kinetic testing is not conducted, we recommend waste rock with AGP:ANP ratios less than 3:1 be classified as PAG for purposes of proper disposal.

Response 5-1: Based on waste rock characterization tests conducted to support the Leeville Project POO and Water Pollution Control Permit applications, the amount of PAG waste rock predicted to be produced during the Leeville Project was 11.4 percent of total waste rock, as reported in (Table 3-6b – Leeville Final EIS). Table 3-1 in the final SEIS has been revised accordingly.

The waste rock composites represent bulk compositions for each of the ore and waste rock types at Leeville (page 3-3, Final EIS BLM 2002a). Composites were developed using geologic logs, assay data, carbon classification, and the mine plan. A suite of 973 samples from drill cuttings were used in the composite construction. Of these, 37 percent were from Turf waste rock, 26 percent West Leeville waste rock, and 12 percent Four corners waste rock. The remaining samples (25%) were from various ore types. The composite samples were carefully selected and are representative of rock at Leeville.

The calculations of NNP summarized in Table 3-6b (Final EIS BLM 2002a) are incorrect. The conversion factor used in calculating the NNP from NCV (i.e., 2.27 X NCV) is an order of magnitude lower than the correct conversion factor (i.e., 22.7 X NCV). The corrected NNP calculations from the original Table 3-6b are provided in the revised Table 3-6b below. Shaded areas in the Table represent the changes from the original Table 3-6b.

As indicated in the corrected Table 3-6b, the run-of-mine weighted average NNP for waste rock as calculated from NCV x the conversion factor of 22.7 equals 133 T $CaCO_3$ / kton which compares favorably with the master waste rock composite value of NNP shown in Table 3-6a at 121 T $CaCO_3$ / kton.

Net Carbonate Value (NCV) is a measure of the acid generating or neutralizing potential of waste rock based on its sulfide and carbonate content as determined by LECO furnace analysis (ASTM E1915-07a). NCV is determined using data generated from laboratory methods that are similar to those used to measure acid-base account for samples.

Combining static testing (ABA and NCV) with an evaluation of mineralogy data for the various rock types that will be mined and the associated alteration products substantially increases the confidence for the static test results as an operational characterization tool, and provides a reasonable basis for predicting the acid-generating potential of waste rock. At Leeville, and other mines on the Carlin Trend, predictions of the acid-generating potential of waste rock have been based on detailed analyses of the mineralogy of mined rock. In addition, other studies are used to increase the understanding of behavior of rock materials in the environment including Meteoric Water Mobility Procedure (MWMP), Biological Acid Production Procedure (BAPP), Peroxide Acid Generation test, paste pH, and at some mine projects – Field Oxidation Tests. Ongoing analyses of the acid-generating potential of waste rock to be mined at future mines, such as Emigrant and Genesis, are being completed as part of project permitting, and will be presented in the environmental impact statements for those projects.

Response 5-1 (continued):
Many of EPA's comments on the draft SEIS, which address measures for characterizing waste rock associated with the Leeville Mine, reiterate comments that EPA submitted on the Leeville Project EIS in 2002. Project-specific measures for characterizing and managing waste rock were evaluated by BLM and NDEP during permitting of the Leeville Project, as summarized in the Leeville Project EIS (BLM 2002a). As BLM previously determined, adequate representative sampling of waste rock was conducted and appropriate waste rock management requirements are in place to address potential acid generation associated with waste rock mined at the Leeville Mine (see Leeville Project Final EIS, pp. 4-6 to 4-7). All waste rock brought to the surface from underground mining at Leeville, regardless of its ANP/AGP ratio value, is placed in an engineered WRDF, which is designed to contain PAG waste rock and ensure that there is no release of acid rock drainage outside of the containment of the WRDF. The PAG WRDF at Leeville has been constructed with a compacted base layer, drains and a lined seepage collection pond. Appendix A of the Leeville Final EIS (BLM 2002a) describes in detail the waste rock handling plan and storage facility for waste rock generated at the Leeville facility. Ongoing groundwater and surface water monitoring associated with the Leeville Mine do not indicate any acid rock drainage associated with the current waste rock management program (Newmont 2007, 2008, 2009).

TABLE 3-6b (revised by AMEC Geomatrix)

Summary of NCV Data for Waste Rock Units

Leeville Mine Project

Tons	% of Tons	No, Samples		Total Carbon	Organic Carbon	Carbonate Carbon	Total Sulfur	Sulfate Sulfur	Sulfide Sulfur	ANP %CO2	AGP %CO2	ANP/AGP	NCV $\%CO_2$	NNP T $CaCO_3$ /kton
		Assay	Leco											
West Leeville Upper Plate UC WLW1														
22,100	0.55	59	59	2.67	0.81	1.86	1.36	0.34	1.02	6.83	1.41	4.85	5.42	123
West Leeville Upper Plate CSR WLW2														
103,300	2.59	113	113	1.24	0.82	0.42	1.47	0.28	1.20	1.55	1.64	0.94	-0.09	-2.1
West Leeville Lower Plate UC WLW3														
2,937,300	73.73	119	112	3.20	1.05	2.15	1.20	0.30	0.90	7.90	1.24	6.37	6.64	151
Four Corners Lower Plate UC, CSR, UI FCW1														
212,100	5.32	131	88	0.84	0.57	0.27	1.31	0.17	1.14	1.03	1.56	0.66	-0.58	-13.1
Turf Upper Plate UC TW1														
0	0.00	105	105	2.22	0.52	1.70	0.68	0.27	0.41	6.24	0.56	11.06	5.68	129
Turf Upper Plate VCSR TW2														
15,300	0.38	205	205	1.20	0.85	0.34	1.00	0.31	0.69	1.27	0.94	1.35	0.31	7.1
Turf Lower Plate Dp UC TW3														
125,200	3.14	62	62	3.30	1.75	1.55	2.42	0.34	2.08	5.75	2.85	2.02	2.86	64.9
Turf Lower Plate SDrm UC														
568,700	14.27	36	36	2.44	0.37	2.06	1.36	0.35	1.01	7.59	1.39	5.46	6.19	141
Total Waste Rock														
3,984,000	100	830	780											
Run-of-Mine Weighted Average for Waste Rock														
				2.90	0.94	1.97	1.27	0.30	0.97	7.22	1.25	5.76	5.87	133
PAG Percent of Total Waste Rock Tonnage														
	11.44													

Notes: T = tons; kton = 1,000 tons

NCV = net carbonate value; ANP = acid neutralizing potential; AGP = acid generating potential; NNP = net neutralizing potential; CO_2 = carbon dioxide; CaCO3 = calcium carbonate; UC = unoxidized carbonate; WLW = West Leeville Waste Rock; CSR = carbon sulfide refractory; UI = unoxidized intrusive; FCW = Four Corners Waste rock; TW = Turf Waste rock; Dp = Popovich Formation; SDrm = Roberts Mountain Formation.

Conversion: NCV ($\%CO_2$) times 22.7 = NNP (T $CaCO_3$/kton rock)

Source: Coxon 1997

Accurate characterization of the waste rock is important in determining the amount and timing of available neutralizing waste rock to sufficiently encapsulate and buffer the PAG rock. One purpose of a waste rock handling plan is to specify how the distinctions within and between the different rock types will be made during operations and how each rock type will be disposed accordingly. In the case of the Leeville mine, the timing of the production of different waste rock types offers little flexibility, and stockpiling or using borrow material may be necessary to assure appropriate disposal of PAG rock with sufficiently neutralizing material. 5-2

Recommendation: The site specific waste rock handling plan should identify all areas of PAG waste rock based on the appropriate geochemical analysis, and identify the source of neutralizing material for each phase when PAG waste rock is disposed. The Final SEIS should describe this site specific waste rock handling plan, and it should be included in the Record of Decision (ROD).

EPA is concerned that Newmont's *Refractory Ore Stockpile and Waste Rock Dump Design, Construction and Monitoring Plan* (2003) does not include sufficient measures to ensure that waste rock piles are adequately designed to prevent acid mine drainage where there is a considerable amount of PAG waste rock. In addition, it remains unclear whether sufficient neutralizing waste rock is available at the Leeville mine to prevent acid generation or whether borrow material may be needed to adequately neutralize PAG waste rock at the mine. We have serious concerns about the existing plan for waste rock management at this mine for the following reasons:

- The plan specifies that sulfide waste rock dumps are placed on a 12-inch layer of waste rock, existing subsoil, or borrowed subsoil with a permeability of 1×10^{-5} cm/sec or less. EPA's analysis has determined that such a layer would not necessarily preclude leachate movement through it. 5-3

- The plan specifies that PAG material within the waste rock dump is encapsulated with a 10-foot layer of waste rock with an ANP:AGP ratio of at least 3:1, especially in situations where the first-loaded material is PAG. A thick neutralizing base layer is a positive component of the management plan. However, the plan does not account for the actual amount of neutralizing waste rock needed for each PAG cell based on stoichiometry. For example, a ten-foot layer of neutralizing rock may not be sufficient for lifts of PAG waste rock many times thicker.

- The plan does not specify that sulfide waste rock would be encapsulated on all sides with sufficiently neutralizing waste rock. PAG rock could be laterally surrounded with "non-reactive material," which would not necessarily provide any neutralizing potential. The appropriate volume and neutralizing capacity of encapsulating rock needs to be calculated for each lift of PAG rock based on stoichiometry of the material.

Response 5-2: As discussed in **Response 5-1,** all waste rock brought to the surface from underground mining at Leeville is managed within a WRDF designed for encapsulation of PAG material. Additional details are included in response to comments 1-4 thru 1-9 (USEPA comment letter on the Leeville DEIS) and response 18-4 (USF&WS comment letter) of the Final EIS (BLM 2002a).

The ANP/AGP ratio for waste rock produced from production drifts at Leeville, which are all in Lower Plate carbonate rocks, has ranged from 3.92:1 to 18.95:1. During shaft sinking in Upper Plate siliciclastic rocks, the ANP/AGP ratio varied from 0.44:1 to 3.42:1. All waste rock produced at Leeville is managed in compliance with the approved plan (BLM 2002a, Appendix A) and Water Pollution Control Permit No. NEV0090056 issued by NDEP. As indicated in Appendix A of the Final EIS – Leeville Project, any material with an ANP/AGP ratio of less than 3:1 that is placed on the Leeville Waste Rock Facility will be encapsulated with a minimum of 10 feet of rock with an ANP/AGP ratio greater that 3:1. As indicated above, actual mine production demonstrates that sufficient Encapsulation Material will be available from underground sources to meet the encapsulation requirements for PAG at the Leeville Mine.

The Record of Decision (ROD) for the Leeville Mine was issued on September 25, 2002. Operations at the Leeville Mine are being conducted in accordance with provisions contained in the ROD. BLM is not aware of any new information or changed circumstances that would justify a reevaluation of the geochemistry of waste rock associated with the Leeville Mine at this time.

Response 5-3: As discussed above, measures for characterizing and managing waste rock in connection with Leeville operations were evaluated in prior permit application review and analyses. The current plan for characterizing and managing waste rock at Leeville was previously approved by the Nevada Division of Environmental Protection (NDEP) and reviewed by BLM. Pursuant to the State of Nevada's water pollution control permit program, NDEP approved Newmont's Refractory Ore Stockpile and Waste Dump Design, Construction and Monitoring Plan (2003). As discussed in the Leeville FEIS, that plan includes specific requirements for characterizing and managing waste rock generated at Leeville to ensure that water resources are not adversely impacted by acid generation within the waste rock disposal facilities (Leeville FEIS, pp. 2-23 to 2-28, 3-3 to 3-5, and 4-2 to 4-5). BLM is not aware of any new information or changed circumstances that would require reevaluation of the waste rock characterization and management requirements for Leeville. There are no known incidences of acid rock drainage being released to the environment from the waste rock disposal facilities at Leeville.

Recommendation: The Final SEIS and ROD should describe how sufficient neutralizing material will be assured and all waste rock will be properly disposed during all phases of the project to prevent acid rock drainage. If the volume and neutralization potential of waste rock will not be sufficient based on stoichiometry, we recommend appropriate borrow material be used. The Final SEIS and ROD should identify borrow sources that would be used if deemed necessary. 5-3 (contd)

Recommendation: We recommend an implementation monitoring plan be developed and followed to ensure proper placement of waste rock.

The Final EIS and Draft SEIS do not specifically discuss the potential impacts of contamination of groundwater from the waste rock dump should the facility fail to contain and control all waste rock drainage (acidic and neutral), both beneath and downgradient of the facility. They also do not provide information on how contaminated groundwater or surface water would be mitigated should it occur. 5-4

Recommendation: The Final SEIS should discuss the potential impacts to surface water and groundwater resources should the waste rock dumps generate uncontrolled drainage either in the short- or long-term, and describe contingency measures to control these releases.

Financial Assurance

In light of the uncertain but potentially significant amount of PAG waste rock at this mine, EPA has serious concerns that bonding for this project may be significantly underestimated because additional borrow material may be necessary. Adequate bonding is critical to ensure funds will be available to properly close the site and reduce the potential for future taxpayer liability. 5-5

Recommendation: We recommend BLM reevaluate the reclamation bond, taking into account the potential need for neutralizing borrow material. The Final SEIS and ROD should support the bond estimate and update it as necessary.

In light of the uncertainty whether sufficient neutralizing waste rock is available for the Leeville project, it is unclear that the high volume of PAG waste rock disposed since 2002 has been sufficiently encapsulated/neutralized. The Leeville Mitigation Plan (Final EIS, Appendix A, p. 2) states that long-term trust funds as described in 43 CFR 3809.552(c) will be established at the time the closure plan is completed, if warranted. However, the Final EIS and Draft SEIS do not assess the potential costs of long-term monitoring and treatment or hauling of contaminated groundwater or effluent should it occur, or predict when it could occur. For example, the Draft EIS indicates that seepage from the waste rock facility seepage collection system will be hauled to Newmont's Mill 4 tailing facility. As we have stated in the past, BLM should not wait until closure to determine whether a long-term operation and maintenance plan will be needed to avoid environmental degradation in the future. Such determinations are a part of project 5-6

Response 5-4: NDEP evaluates the design and construction of each waste rock disposal facility built in the Carlin Trend for conformance with regulations and to ensure that leachate formation is controlled and limited to reduce or eliminate release of trace metals to the environment. BLM reviews these designs.

Waste rock disposal facilities are constructed on a base of compacted, low-permeability material designed to limit or minimize vertical migration of fluids. The compacted base is sloped to allow drainage to a collection point. The majority of water draining to the collection point is lost to evaporation. Excess water accumulating in the collection pond is transported via pipeline to the 4/2 tailing impoundment in the North Operations Area. Surface drainage upslope of the base perimeter is diverted to prevent run-on to the disposal facility. Additionally, agencies require installation of monitoring wells to ensure that leachate is not affecting the environment.

Discovery of leachate that is releasing trace metals to the environment through the monitoring program could lead to mitigations involving removal of portions of waste rock disposal facilities and reconstruction of the facility to arrest the problem areas. Other options may include regrading the surface of the facility to reduce the amount of infiltration that is occurring in the facility. Agencies will maintain reclamation bonds on facilities until adequate stability (physically and leachate formation) is achieved.

Response 5-5: Pursuant to applicable Federal (43 CFR 3809) and State of Nevada (NAC 519A.380) requirements, the adequacy of financial assurance for reclamation of the Leeville Mine is reviewed at least every three years. For projects that provide phased bonding, adequacy of financial assurance is reviewed annually (43 CFR 3809.553b). Pursuant to those requirements, BLM and NDEP have routinely reviewed the financial assurance of the Leeville Project since the initial approval in 2002, and bond amounts are increased commensurate with current estimated reclamation costs. Periodic reviews of financial assurance will continue to be conducted until reclamation is complete. Newmont currently maintains a bond level of $11.8 million for Leeville.

Response 5-6: Based on available data, the amount of neutralizing waste rock available to encpsulate PAG material for the Leeville Project appears adequate. The reviewer implies a contingency bonding effort may be necessary prior to completion of the Closure Plan, which is specifically ruled out in 65 Fed. Reg. 69998, 70069 (2000). The Draft and Final SEISs were compiled to address cumulative effects for the Leeville Project. Development of post-closure, long-term operation and maintenance plans is outside the scope of the SEISs. As stated in the Leeville FEIS (BLM 2002a), a final closure plan would be developed with NDEP within two years of mine closure. Also see Response 5-4.

evaluation during project planning because they are necessary for decisions on whether and how the proposed project should go forward. If a long-term trust fund is deemed necessary, early contribution of funds is necessary to ensure adequate funds will be available in the future to cover operation and maintenance after the mine is closed. Deferring payments for many years would require a larger sum to be paid by the mine operator near or after project completion.

Recommendation: The Final EIS should provide a more thorough evaluation of the potential long-term operation and maintenance requirements at the Leeville mine, and describe and ensure total neutralization of all PAG waste rock, as well as containment, treatment or other proper disposal of all fluids exceeding water quality standards in perpetuity. 5-6 (contd)

Recommendation: The Final EIS and ROD should describe the long-term operation and maintenance plan in detail and identify and justify the amount and terms of the trust fund.

Mercury Air Emissions

The Emigrant Project Draft EIS (p. 4-11) and Leeville Mine Draft EIS (p. 4-14) both indicate that ore processed from those mines at the South Operations Area would offset production from existing sources with no projected increases in total annual mercury emissions from the South Operations Area. It is unclear what such offsets would entail and which existing sources would be offset. Different ore bodies contain different amounts of mercury. Although mercury emissions controls at Newmont's South Operations Area capture a substantial amount of mercury at its processing facilities, emissions are a function of the mercury content of the ore. None of the earlier EIS analyses conducted for the SOAPA, Leeville, or Emigrant projects estimate the amount of mercury that could be released into the air by processing ore from the Leeville and Emigrant mines, describe how controls at the South Operations facilities will reduce mercury emissions from these ores, or discuss potential deposition impacts to watersheds. In addition, it is unclear whether the current mercury emissions at the South Operations Area, reported as 311 pounds for 2006 (Draft SEIS, Table 3-2), are expected to be similar over the remainder of the life of the Leeville project. 5-7

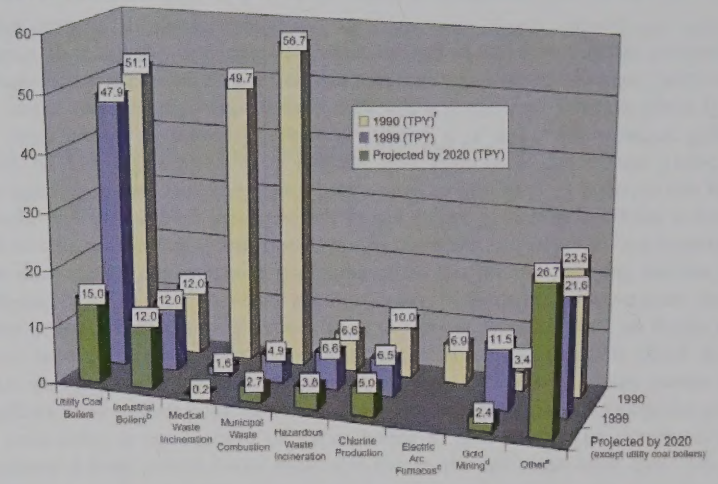
Recommendation: The Final SEIS should provide additional information regarding ore sources and existing and future projected mercury emissions and watershed deposition impacts from Emigrant, SOAPA, and Leeville ore processing at South Operations, as well as from other mines that may foreseeably be processed at Newmont's South Operations. This discussion should break down the mercury emissions projections for each mine to illustrate how emissions are, or will be, offset.

Recommendation: The Final SEIS should provide an updated, detailed list of all sources of mercury, the unit processes that generate mercury, and the equipment included in the system to condense, capture, and/or treat mercury and reduce mercury emissions.

Response 5-7: The Nevada Mercury Air Emissions Control Program adopted in 2006 requires reporting of mercury emissions from stationary sources that process gold or silver ore (NAC 445B.2 – 445B.41). Newmont's Gold Quarry ore processing facilities reported a total of 311 pounds of mercury emitted during calendar year 2006 (928 pounds annually from all sources in the Carlin Trend).

Mercury emissions from the U.S. are estimated to contribute 3 percent of the global total, of which gold mining and processing accounts for about 0.16 percent (USEPA 2008). The following figure taken from EPA's Roadmap for Mercury, July 2006 indicates where mercury emissions from gold mining ranks in terms of other sources of mercury on a national basis.

FIGURE 2. Air Emissions Data for Mercury



[a]Fifteen tons per year will be acheived when full implementation of the Clean Air Mercury Rule is achieved, which may exceed 2020.
[b]Growth in this sector is being offset by regulation.
[c]Electric Arc Furnaces data not available for 1999. The 2002 estimate is 10 tons per year.
[d]The 1990 emissions estimate is a preliminary estimate and is based on back calculations and assumptions using data from 1999 along with information about types of processes, production rates, and ores used in 1990 compared to 1999.
[e]These projected emissions do not account for reductions from non-regulatory actions described elsewhere in the Roadmap.
[f]1 ton equals 0.9070 metric ton

The 2006 testing required for Tier 1 facilities under Nevada's Mercury Control Program has revealed that the pre-heaters at Newmont South Operations Area emit a significant amount of mercury air emissions. 5-8

> **Recommendation:** The Final SEIS should identify the controls Newmont anticipates installing on these units in the second phase of Nevada's Mercury Control Program, and discuss whether a significant change in the pre-heater emissions is expected.

In the section addressing mercury emissions, the Draft SEIS discusses a recent study by EPA's contractor, ICF International (November 30, 2006). The Draft SEIS (p. 3-17) states this report concludes that "the dominant influence on air quality impacts for mercury is generally the source closest to the receptor." This is an incorrect interpretation of the report. The analysis in the report for individual states focuses on the single grid cell where sources in that state contribute the most to deposition. For instance, Figure 7-42 of the report depicts the single grid cell (blue triangle) with the maximum simulated contribution from sources within Utah. The "Contributions to Total Deposition" chart in Figure 7-42b of the report indicates that, for this grid cell, Utah sources are contributing 74.7% of total deposition. This single grid cell is not necessarily the location in the state that has the greatest overall mercury deposition or the greatest deposition from out of state sources. Therefore, it does not present a complete picture of how Nevada sources, and northern Nevada sources in particular, are affecting neighboring states. 5-9

In order to draw conclusions about the cumulative impacts of mercury in the cumulative effects study areas (CESA), the model's GIS AggreGATOR tool should be used. For any given 12-km grid cell within the United States, the tool can be used to trace mercury emissions back to the sources that were tagged for the model. For example, Gold Quarry is individually tagged in the model, as are the Barrick Gold Strike, Twin Creeks, Jerritt Canyon, Bald Mountain, and Cortez mines. In addition, the model includes a collective tag for all Nevada gold mines.

This model and tool will be updated within the next few weeks, and we will provide BLM with a copy as soon as it is available. The current version of the tool allows the user to trace emission related deposition backward from a 12-km grid to the tagged sources. The update will allow users to start with individual or combined tagged sources of interest and determine their deposition impacts. This application should, in turn, help the user delineate a reasonable CESA for mercury impacts.

> **Recommendation:** The Final SEIS should describe and quantify in detail the mercury impacts in the CESA based on the modeling results, which can be accessed with the updated GIS AggreGATOR tool.

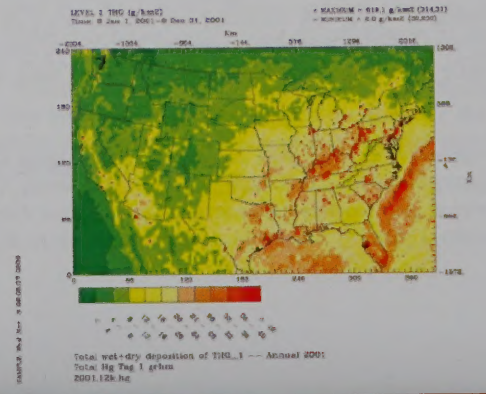
The Emigrant Mine should be included in the CESA because of its ore processing association with the South Operations Area. The CESA for air and water resources affected by mercury may 5-10

Response 5-8: Emissions from ore pre-heaters in the South Operations Area have decreased from 267.05 lbs/yr Hg in 2005 to 51.92 lbs/yr Hg in 2006 (reported to NDEP-BAQP in 2006 Annual Hg Emissions Addendum) and were further reduced to 23.81 lbs/yr Hg in 2007 (reported to NDEP-BAQP in 2007 Annual Hg Emissions Addendum) based on annual source testing. Newmont is proposing additional control(s) to achieve NVMACT under the Phase II permitting application for the Nevada Mercury Air Emissions Control Program (NMCP).

Controls that could be installed during the second phase of the mercury control program include and Energy Recover System (to cool the gas stream); addition of chemical additives to the caustic scrubber; improved retort efficiency; and add carbon absorbers.

Response 5-9: The discussion about mercury in the Draft SEIS discloses that, at the peak impact point in Utah, the effect of mercury from Nevada sources is minor. The Draft SEIS is correct, except that for purposes of the USEPA/ICF International document, the "peak impact point" is defined as the point with peak impacts from sources within Utah only. Essentially, the document defines a peak impact point using sources within the state only; then the document determines how much is contributed by other states at that point. The possibility that there could be a higher peak impact point at some other location than the one predicted by the Utah sources alone detailed in the comment is inconsistent with the national model results (see figure below) which shows the peak impacts when all states are considered as being at the same location. Peak deposition at the peak impact point in Utah is approximately 63 grams per square kilometer (g/km^2). Of this total, less than 0.2 percent (0.13 g/km^2) is sourced from other states. The national map shown below shows that impacts on the portion of Utah nearest the Carlin Trend are some of the lowest deposition rates in the state of Utah and not indicative of any substantial migration of mercury from sources in the Carlin Trend. At the peak impact point in Nevada, the deposition rate was 70.2 g/km^2, decreasing to less than 12 g/km^2 in the area east of Carlin. Based on this information, it is unlikely that sources in the Carlin Trend have any measurable contribution to mercury deposition Utah. It is not clear whether **Figure 7-42** reflects the model results from Utah sources only, but it is clear the national figure (Figure 6-3c below) includes the sources from all states and presents the same picture for Utah as Figure 7-42. On **Figure 7-42(b)**, the discussion concerns results at the blue triangle location, which is defined on the basis of Utah-only sources.

Figure 6-3c. Simulated Annual Mercury Deposition (g km^{-2}) for the REMSAD 12-km Modeling Domain (with GRAHM Boundary Conditions): Total (Dry + Wet) Deposition.



need to be expanded based on the results of the modeling.' The updated model and tool, which will allow users to start with individual or combined tagged sources of interest and determine their deposition impacts, should help BLM to delineate a reasonable CESA for mercury impacts. The cluster of grid cells that are demonstrated by the model to be affected to a reasonable degree by mercury deposition in and from northern Nevada should suggest the location and extent of the CESA. 5-10 (contd)

Recommendation: We recommend BLM reconsider the CESA associated with mercury emissions. The Final SEIS should describe how the CESA was delineated and support the decision with the model results.

Appendices 5-11

Appendices A, B, and C are missing in the Draft SEIS and should be provided in the Final SEIS.

Response 5-10: The Cumulative Effects Study Area for air resources is based on regulated emission sources and fugitive dust sources that could combine together and result in an additive impact on the environment. The state of Nevada has developed their regulatory program for air emissions using designated airsheds that are based on hydrographic basins. As such, the determination of cumulative impacts for air pollutants uses these airshed basins as the model inputs. The proposed Emigrant Mine is located in an airshed basin that is too distant (based on model criteria) from other sources in the Carlin Trend to include as an additive source for cumulative effects assessment.

It is appropriate to include mercury emissions that result from processing carbon impregnated with precious metals from leach operations at the proposed Emigrant Mine in the modeled area for cumulative effects to air quality because the carbon is processed at the South Operations Area. Emissions from operations that would be associated with the proposed Emigrant Project that are not included in the cumulative effects include gaseous emissions from mining equipment and fugitive dust from haul trucks and mining equipment. The model domain as described in the Air Quality section of this Final SEIS provides the rationale for the cumulative effects study area designation.

No peer-reviewed mercury model is available to assess the direct, indirect, and cumulative deposition of mercury from sources within the Carlin Trend.

Response 5-11: Appendices A, B, and C are included in this Final SEIS.

CHAPTER 6

REFERENCES

AATA International, Inc. 2009. Betze/Post Mine Seep and Spring Study, 20 Year Summary Report. Prepared for Barrick Goldstrike Mines Inc. March.

AECOM Environment. 2009. Electronic mail from Bruce Macdonald, Vice President, Regional Air Quality Practice Leader to Scott Duncan and forwarded to Kirk Laird, Genesis EIS Project Manager for BLM concerning mercury emissions from TS Power Plant. January.

Barrick Goldstrike Mines, Inc. (Barrick). 1990. Boulder Valley Monitoring Plan.

_____**2006**. 2005 Hazardous Waste Report for Barrick Goldstrike Mines Inc. February.

_____**2007a.** Boulder Valley Monitoring Plan, Fourth Quarter 2006 and First Quarter 2007 Report.

_____**2007b.** Electronic mail from Joe Giraudo with Barrick to Deb McFarlane of BLM Elko Field Office concerning use and storage of hazardous materials at Barrick's operations. August 3, 2007.

_____**2007c.** Water Pollution Control Permits for Betze Mine, 2007 Second Quarter. Submitted to Nevada Bureau of Mining Regulation and Reclamation, Carson City, Nevada.

_____**2007d**. Electronic mail from Joe Giraudo with Barrick to Deb McFarlane of BLM Elko Field Office concerning annualized costs for Barrick operations in the Carlin Trend. August 13, 2007.

Basin Tree Service and Pest Control, Inc. 2005. Letter report authored by Jess Gilbert, Nevada Branch Manger for United Right-of-Way dba Basin Tree Service and Pest Control, Inc. dated September 13, 2005.

_____**2006.** Letter report authored by Jess Gilbert, Nevada Branch Manger for United Right-of-Way dba Basin Tree Service and Pest Control, Inc. dated September 11, 2006.

_____**2007.** Letter report authored by Jess Gilbert, Nevada Branch Manger for United Right-of-Way dba Basin Tree Service and Pest Control, Inc. dated September 2007.

Bowles, A. 1995. Responses of Wildlife to Noise *in* Wildlife and Recreationists: Coexistence through Management and Research. Island Press. Washington D.C.

Braun, C. 2006. *In:* A Blueprint for Sage-grouse Conservation and Recovery. Grouse Inc. Tucson, Arizona. May.

Bureau of Land Management (BLM), U.S. Department of Interior. 1987. Elko Resource Management Plan Record of Decision. Elko District Office. Elko, Nevada.

_____**1991**. Final Environmental Impact Statement, Betze Project. Barrick Goldstrike Mines, Inc. Elko District Office. Elko, Nevada.

1993. South Operations Area Final Environmental Impact Statement and Record of Decision. Elko District Office. Elko, Nevada.

2000. Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project. Elko District Office. Elko, Nevada.

2002a. Final Environmental Impact Statement, Newmont Mining Corporation's Leeville Mine Project. Elko District Office. Elko, Nevada. July.

2002b. Final Environmental Impact Statement, Newmont Mining Corporation's South Operations Area Project Amendment. Elko District Office. Elko, Nevada. April.

2003. Final Supplemental Environmental Impact Statement, Betze Project. Barrick Goldstrike Mines, Inc. Elko District Office. Elko, Nevada.

2005a. Programmatic Environmental Assessment Oil and Gas Lease Sale. Elko District Office, Elko, Nevada.

2005b. Buffalo Fire Closure Assessment. Memorandum. Elko District Office, Elko, Nevada.

2006a. Project and Planning Schedule. Elko District Office. Elko, Nevada. September.

2006b. Functioning condition surveys of Willow, Lewis and Nelson creeks. BLM files. Elko District Office. Elko, Nevada.

2006c. Fire closure assessment of stream and riparian criteria in the Beaver Creek Riparian Pasture. Memorandum. Elko District Office. Elko, Nevada

2006d. Annual Report prepared for Programmatic Biological Opinion, Elko Fire Management Plan Amendment. Elko District Office. December 13, 2006.

2006e. Susie Fire (CR28) Emergency Stabilization and Rehabilitation Plan Environmental Assessment Finding of No Significant Impact and Decision Record and Project Approval BLM/EK/PL-2006/021. Elko District Office. Elko, Nevada.

2007a. Draft Supplemental Environmental Impact Statement Leeville Project. Elko District Office. Elko, Nevada. August.

2007b. Restoration and reseeding information from geographic information system database provided by Elko District Office. Elko, Nevada. August.

2009a. Approved Resource Management Plan Amendments/Record of Decision (ROD) for Designation of Energy Corridors on Bureau of Land Management –Administered Lands in the 11 Western States. January.

2009b. Betze Pit Expansion Project Final Supplemental Environmental Impact Statement. Elko District Office. Elko, Nevada. March.

_____**2009c.** Electronic mail December 1, 2009, from Deb McFarlane with Elko District Office to Terry Grotbo of Geomatrix Consultants, Inc. concerning waste rock quantities for Betze/Post Mine.

_____**2010a.** Personal communication from D. McFarlane, BLM Non-renewable, Assistant Field Manager, Tuscarora Field Office, Elko District Office to Terry Grotbo and Joe Murphy, AMEC-Geomatrix Consultants, Inc. concerning, concerning past, present, and reasonably foreseeable mining activity in the Carlin Trend. January 8, 2010.

_____**2010b.** Personal communication from Deb McFarlane with Elko District Office to Joe Murphy of AMEC - Geomatrix Consultants, Inc. concerning oil, gas, and geothermal leases in Carlin Trend. January 12, 2010.

Cedar Creek Associates, Inc. (CCA). 2004. Riparian Monitoring – 1st Interim Effort for Upper Willow Creek Habitat Enhancement Plan, Squaw Valley Ranch – Upper Willow Creek, Nelson Creek & Lewis Creek. Prepared for Barrick Goldstrike Mines.

Ciciliano D., T. Harris, D. Taylor and D. Zyl. 2008. Analysis of Economic and Occupational Skill Impacts of the Hard Rock Mining Sector on the Elko Micropolitan S.A. Economy. University of Nevada. Reno. September.

Coca, M. 2007. Personal communication from Mark Coca, Weeds Management Specialist, BLM Elko District Office, to Carol Evans, fisheries biologist, BLM Elko District Office. August 03, 2007.

Colorado State University. 2004. Interagency Monitoring of Protected Visual Environment (IMPROVE) data. Website located at: http://vista.cira.colostate.edu/DatawareHouse/IMPROVE/Data/AEROSOL/Help/IMPROVELocTable.txt

Coope, J. 1991. Carlin Trend Exploration History. Discovery of the Carlin Deposit: Nevada Bureau of Mines and geology. Special Publication No. 13.

Cornell Laboratory of Ornithology. 2001. Black Tern. Website located at: http://www.birds.cornell.edu/BOW/BLkTER/

Dobra J. 2007. Economic Overview of the Nevada Mining Industry. Natural Resource Industry Institute. University of Nevada. Reno.

Elliott, J. 2004. State of Nevada Department of Wildlife. Lahontan Cutthroat Trout Species Management Plan for the Upper Humboldt River Drainage Basin. December.

Environmental Management Associates, Inc (EMA). 2006. Report #1986 Air Quality Impact Analysis, Gold Quarry Project, Eureka County, Nevada.

_____**2007a.** South Operations Area and Leeville Mine Cumulative Air Quality Impact Assessment Report No. 2009-01. Prepared for: Newmont Mining Corporation. Carlin, Nevada. July.

_____**2007b**. Environmental Evaluation – North Operations Area, Eureka County, Nevada. Air Quality Impact Analysis, Report No. 2012-01. March.

ENSR International (ENSR). 2004a. Environmental Report for the TS Power Plant, Eureka County, Nevada. Document No. 00771-020-100 prepared for Newmont Nevada Energy Investment LLC. Elko, Nevada.

_____**2004b**. TS Power Plant Class I-B Operating Permit to Construct Application. Prepared for Newmont Nevada Energy Investment LLC. Carlin, Nevada. Submitted to Nevada Division of Environmental Protection. Carson City.

Evans, C., 2007. Comments on Draft Preparation Plan – Fisheries-Riparian-Aquatic Resources. Written communication from Carol Evans to Deb McFarland, BLM Elko District Office. March 06, 2007.

Federal Energy Regulatory Commission (FERC), Office of Energy Projects. 2009. Ruby Pipeline Project. FERC/EIS – 0232D. Washington, D.C. 20426.

Fitzgerald, W., R. Mason, and G. Vandal. 1991. Atmospheric cycling and air-water exchange of mercury over mid-continental lacustrine regions. Water and Soil Pollution, 56: 745-768.

Geomega. 2001. Gold Quarry Pit Lake Chemistry Update.

_____**2007.** Tara Pit Lake Water Quality Prediction Update. Prepared for Newmont Mining Corporation, Carlin, Nevada. March 26, 2007.

Goddard Institute for Space Studies. 2007. Annual Mean Temperature Change for Three Latitude Bands. Datasets and Images. GISS Surface Temperature Analysis, Analysis Graphs and Plots. New York, New York.

Governor's Sage Grouse Conservation Team (GSGCT). 2001. Western Governor's Association. The Nevada Sage Grouse Conservation Strategy [Webpage]. Website located at: http://www.westgov.org/wga/initiatives/enlibra/sage_grouse.pdf.

Great Basin Ecology, Inc (GBE). 2009. Draft Carlin Trend Mule Deer Migration Corridor Survey Report. May.

Harrington, T. 2005. Economic Development Director for Whitehall, Montana, in a presentation at the Battle Mountain "Mining & Development" Workshop. February.

HCItasca Denver, Inc. (HCItasca) 2009. 2009 Update of Carlin Trend Numerical Groundwater Flow Model. Prepared for Newmont Mining Corporation. June 2009.

Herron, G., C. Mortimore and M. Rawlins. 1985. Nevada Raptors, Their Biology and Management. Nevada Department of Wildlife. Biological Bulletin No. 8.

Hockett, B. 2007. Electronic mail from Bryan Hockett with the Elko District Field Office to Terry Grotbo of Geomatrix Consultants, Inc. concerning cultural resources in the area of potential effect for the SOAP A Draft SEIS. August 8, 2007.

Hydrologic Consultants, Inc. (HCI). 1999. Numerical Groundwater Flow Modeling for Newmont Mining Corporation's South Operations Area Project Amendment, Eureka County, Nevada.

_____**2007**. Technical Memorandum from HCI to Newmont, Subject: Predicted Impacts to Ground Water in Boulder Valley due to Pumping from Section 35, T34N, R48E for TS Power Plant Water Supply. January 17, 2007.

ICF International (ICF). 2008. Model-Based Analysis and Tracking of Airborne Mercury Emissions to Assist in Watershed Planning. Final Report. Prepared for U.S. EPA Office of Water. November. http://www.epa.gov/owow/tmdl/pdf/final300report_10072008.pdf

iml Air Science. 1996. Facsimile from Mark Weitz (iml Air Science) to Todd White (Newmont) containing $PM_{2.5}$ data. September 4, 1996.

International Panel on Climate Change (IPCC). 2007. Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working *Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, USA.

Jamiel, D. 2007. California Trails Center Manager provided information on new recreation facilities in the Elko area. Conveyed via electronic mail from Deb McFarlane with BLM Elko District Office to Joe Murphy of Geomatrix Consultants, Inc. July 30, 2007.

JBR Environmental Consultants, Inc. (JBR). 2007. Humboldt River baseline study 2006 monitoring results. Final Report. Prepared for Barrick Goldstrike Mines. Elko, Nevada.

Lamp, R. 2007. Personal communication from Rory Lamp, wildlife biologist with Nevada Department of Wildlife to Joe Elliott of Geomatrix Consultants, Inc. concerning wildlife issues in the Carlin Trend . July 11, 2007 and August 13, 2007.

Laybourn, D. 2009. Electronic mail from Dennis Laybourn, Environmental Manager with TS Power Plant to Joe Murphy of AMEC-Geomatrix Consultants, Inc. concerning TS Power Plant. June 17, 2009.

Lin, C. and S. Pehkonen. 1999. The Chemistry of Atmospheric Mercury: A Review. Atmospheric Environment. 33 2067-2079.

Listerud, B. 2007. Upper Willow Creek Habitat Enhancement Project. Personal communication (email) from Mr. Listerud to Jack Cearley of ARCADIS U. S. Inc. April 16, 2007.

McFarlane, D. 1991. Gold production on the Carlin Trend *in* Buffa, R and A. Coyner, Geology and Ore Deposits of the Great Basin.

_____**2009.** Personal communication from Deb McFarlane with BLM Elko District Office to Terry Grotbo of AMEC-Geomatrix Consultants, Inc. concerning spills on State Route 766. December 14, 2009.

MFG, Inc. 2006. Biological reconnaissance and aquatic characterization for Maggie Creek, Eureka County, Nevada. Draft Assessment Report prepared for Newmont Mining Company. Elko, Nevada.

Midwest Research Institute (MRI). 2006. Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors. Prepared for Western Regional Air Partnership. November.

Minnesota IMPLAN Group, Inc. 2006. IMPLAN Pro Data for Elko County and Eureka County, 2004. Stillwater, Minnesota.

Montana Natural Heritage Program Animal Guide 2007. Black Tern. Website located at: http://nhp.nris.mt.gov.animalguide/detail

Morefield, J. 1996. Current knowledge and conservation status of *Eriogonum lewisi*.Reveal (Polygonaceae), the Lewis Buckwheat. Nevada Natural Heritage Program. Department of Conservation and Natural Resources. Carson City. September.

National Academy of Sciences. 2006. Understanding and Responding to Climate Change: Highlights of National Academies Reports. Division on Earth and Life Studies. National Academy of Sciences. Washington, D.C.

National Atmospheric Deposition Program (NADP). 2010. Website located at: http://nadp.sws.uiuc.edu/mdn/. Accessed March 10, 2010.

Nevada Bat Working Group. 2002. Nevada Bat Conservation Plan.

Nevada Department of Employment, Training, and Rehabilitation. 2009. Website located at: http://www.nevadaworkforce.com

Nevada Department of Taxation 2009. General Distribution Statistics 2000 – 2008. Website located at: http://tax.state.nv.us/pubs.htm#excise

Nevada Department of Transportation. 2009. Website located at: www.nevadadot.com/reports_pubs/traffic_report/2008. Accessed December 8, 2009.

Nevada Department of Wildlife (NDOW) 2007a. Mule Deer Herd Prescription Management Area. [Webpage] Located at: http://www.ndow.org/learn/com/mtg/33007_support/13_Area_6_HP_03107.pdf.

_____**2007b**. Nevada Department of Wildlife 2006-2007 Big Game Status. Compiled and edited by Mike Cox, Big Game Staff Biologist.

Nevada Division of Environmental Protection (NDEP). 1996. Waste Rock and Overburden Evaluation Guideline. January.

_____**2008**. Bureau of Air Quality Planning. Nevada Statewide Greenhouse Gas Emissions Inventory and Projections, 1990-2020. Updated December 2008.

_____**2009a**. Bureau of Air Quality Planning website: http://ndep.nv.gov/baqp.

_____**2009b**. EPA Approved Final, Nevada's 2006 303(d) Impaired Waters List. Bureau of Water Quality Planning. February 2009.

Neville, H. and D. DeGraaf. 2006. Reconnecting Fragmented Lanhontan Cutthroat Trout Habitats: Maggie and Willow Creek 2006 Strategies for Restoring Native Trout.

Newmont Mining Corporation (Newmont). 1985. Water Pollution Control Permit No. NEV0090056 issued by Nevada Division of Environmental Protection March 21, 1985.

_____**1992.** Maggie Creek Basin Monitoring Plan.

_____**2005**. Battle Mountain, Social Impact Assessment, Final SIA Report, prepared for Newmont Mining Corporation by ERM. June.

_____**2007a.** Electronic mail from Paul Pettit, Environmental Manager with Newmont to Terry Grotbo of Geomatrix Consultants, Inc. concerning hazardous waste generated by Newmont in the Carlin Trend. June 29, 2007.

_____**2007b**. Emigrant Project Plan of Operations. March.

_____**2007c**. Genesis Project Plan of Operations – Revised. November.

_____**2007d.** Water Pollution Control Permits for Gold Quarry and Leeville Mines, 2007 Second Quarter. Submitted to Nevada Bureau of Mining Regulation and Reclamation, Carson City, NV. July 2007.

_____**2008a.** Electronic mail from Steve Grusing, Newmont Geology Department, to Paul Pettit, Environmental Manager with Newmont concerning mercury content of ore in various Newmont mining operations. February.

_____**2008b**. Electronic mail from Meg Burt with Newmont to Terry Grotbo of AMEC-Geomatrix Consultants, Inc. concerning dewatering rates at Leeville Mine. June 16, 2008.

_____**2008c**. Electronic mail from Brant Ivey with Newmont to Joe Murphy of Geomatrix Consultants, Inc. concerning taxes paid by Newmont. December 11, 2008.

_____**2009a.** Electronic mail from Bryce Vorwaller (TS Ranch) to Meg Burt (Newmont) concerning irrigation and water use on TS Ranch. December 29, 2009.

_____**2009b**. Maggie Creek Basin Monitoring Plan, Fourth Quarter of 2008 and First Quarter of 2009. June 2009.

_____**2009c**. Spring Survey, Gold Quarry, Fall 2008. January 2009.

_____**2010a.** Electronic mail from Meg Burt with Newmont to Terry Grotbo of AMEC-Geomatrix Consultants, Inc. concerning current status of operations and dewatering rates at Leeville Mine. January 13, 2010.

_____**2010b**. Electronic mail from Meg Baker with Newmont to Terry Grotbo of AMEC-Geomatrix Consultants, Inc. dated January 4, 2010 confirming data reported in electronic mail concerning development in the Carlin and Elko areas dated August 3, 2007, remains valid.

_____**2010c**. Electronic mail from Meg Burt with Newmont to Terry Grotbo of AMEC-Geomatrix Consultants, Inc. dated January 18, 2010, confirming electronic mail from Paul Pettit, Environmental Manager with Newmont to Terry Grotbo AMEC- Geomatrix, Inc. dated June 29, 2007, concerning hazardous materials used and stored in Carlin Trend remains valid.

_____**2010d**. Electronic mail from Meg Burt with Newmont to Terry Grotbo of Geomatrix Consultants, Inc. concerning employment, income, contracted services, and annual expenditures for supplies. January 4, 2010.

Open Range Consulting, Inc. 2007. Evaluation of factors affecting Lahontan cutthroat trout in three large watersheds. Draft report. Park City, Utah.

Paine, S. 2007. GQ/LV/LT Yearly Water Production and Distribution Data Compilation, 2000-present. Email and Spreadsheet from Scott Paine to Paul Pettit, Newmont. May 22, 2007.

Pettit, P. 2007. Personal communication from Paul Pettit, Environmental Manager of Newmont to Joe Murphy of Geomatrix Consultants, Inc. concerning water rights in Boulder Valley. August 6, 2007.

_____**2008**. Personal communication from Paul Pettit, Environmental Manager of Newmont to Terry Grotbo of Geomatrix Consultants, Inc. concerning movement of radio-collared mule deer. June 30, 2008.

Porcella, D. 1994. Mercury in the Environment Biogeochemistry *In*: Mercury Pollution Integration and Synthesis. Eds. C. Watras and J. Huckabee. Lewis Publishers. Boca Raton.

Price, S. and T. Harris. 2007. An Analysis of the Economic Impacts of the Hard Rock Mining Sector on the Elko County Economy. University Center for Economic Development, Department of Resource Economics. University of Nevada. Reno. September.

Prichard, D., F. Berg, W. Hagenbuck, R. Krapt, R. Leinard, S. Leonard, M. Manning, C. Noble, and J. Staas. 1999, (Revised 2003). Riparian area management, a user guide to assessing proper functioning condition and the supporting science for lentic areas. Technical Reference 1737-16. U.S. Department of the Interior, Bureau of Land Management, National Applied Sciences Center, Colorado.

Prichard, D., J. Anderson, C. Correll, J. Fogg, K. Gehbardt, R. Kraft, S. Leonard, B. Mitchell, and J. Staas. 1998. Riparian area management, a user guide to assessing proper functioning condition and supporting science for lotic areas. Technical Reference 1737-15. U.S. Department of the Interior, Bureau of Land Management, National Applied Sciences Center, Colorado.

Rhyne, W.R. 1994. Hazardous Materials Transport Risk Analysis: Quantitative Approaches for Truck and Train. Van Nostrand Reinhold. New York.

Rodeo Creek Gold, Inc. 2008. List of chemicals and hazardous materials used and stored at Hollister Block Development operations. August.

Ross, C. 2000. Mine revegetation in Nevada: The state of the art in the arid zone. BLM –NSTC Resource Notes, Issue No. 36.

Ryser, F.A., Jr. 1985. Birds of the Great Basin: A Natural history. University of Nevada Press. Reno.

Schuman, G. and T. Booth. 1998. Strategies for establishment of big sagebrush (*Artemisia tridentata ssp. wyomingensis*) on Wyoming mined lands. Final Report. Abandoned Coal Mine Research Program. High Plains Grassland Research Service. Cheyenne, Wyoming.

Slemr, F. and E. Langer. 1992. Increases in Global Atmospheric Concentrations of Mercury Inferred from Measurements Over the Atlantic Ocean. Nature 1355 (6359), 434.

Sonoran Institute 2007. A Socioeconomic Profile, Elko County, Eureka County, Lander County, and Humboldt County, Nevada. Economic Profiling System, July 2007.

Trout Unlimited. 2007a. Strategies for Restoring Native Trout. [Web Page]. Website located at: http://www.tu.org/site/pp.asp?c=7dJEKTNuFmG&b=356135.

_____**2007b**. Maggie Creek Watershed Restoration Project, Northeastern Nevada poster.

TS Ranch. 2009. Website for TS Ranch located at: http://www.TSRanch.com. Accessed December 3, 2009.

University of California – Davis. 1995. Interagency Monitoring of Protected Visual Environment (IMPROVE) Data Guide. A Guide to Interpret Data. August.

U. S. Census Bureau. 2002. DP-2 Profile of Selected Social Characteristics

_____**2007.** Mapfacts/Fedfacts at: http://www.fedstats.gov/qf/states/32/32007.html.

_____**2009.** State & County QuickFacts. Website located at: http://quickfacts.census.gov/qfd/index.html.

U.S. Department of Agriculture, Soil Conservation Service. 1980. Soil Survey of Tuscarora Mountain Area, Nevada, Parts of Elko, Eureka, and Lander Counties. Washington, D.C. December.

U.S. Department Commerce. 2009. Bureau of Economic Analysis, Regional Economic Information System - Table CA91. Website located at: http://www.bea.gov/index.htm.

U.S. Department of Interior, Fish and Wildlife Service (USFWS). 1995. Lahontan Cutthroat Trout. Website located at: http://ecos.fws.gov/docs/life_histories/E00Y.html.

U.S. Environmental Protection Agency (EPA). 1997. Memorandum form John Seitz, Director, Office of Air Quality Planning and Standards concerning *Interim Implementation of New Source Review Requirements for* $PM_{2.5}$. Region VII, U.S. EPA. October.

_____**2006**. Model-Based Analysis and Tracking of Airborne Mercury Emissions to Assist in Watershed Planning. November.

_____**2008**. Frequently Asked Questions Information on Compact Flourescent Light Bulbs and Mercury July 2008. EPA website accessed January 21, 2010. http://www.energystar.gov/ia/partners/promotions/change_light/downloads/Fact_Sheet_Mercury.pdf

_____**2010**. Fact Sheet - Proposal to Revise the National Ambient Air Quality Standards for Ozone. EPA website located at: http://www.epa.gov/air/ozonepollution/pdfs/fs20100106std.pdf. Accessed January 13, 2010.

U.S. Geological Survey (USGS). 2009. Water Data Report WDR-US-2008, Nevada; Water Year 2008. Website located at: http://wdr.water.usgs.gov/wy2008/search.jsp

Vicklund, L., G. Shuman and A. Hild. 2004. Influence of sagebrush and grass seeding rates on sagebrush density and plant size. USDA Forest Service Proceedings RMRS-P-31.

Warren, T. 2006. Personal communication from Tom Warren BLM Emergency Stabilization and Rehabilitation Manager BLM Elko District Office to Carol Evans, biologist with BLM Elko Field Office.

Western Regional Air Partnership (WRAP). 2007. Fugitive Dust Emission Source Categories. From website: http://vista.cira.colostate.edu/docs/wrap/emissions/DustEmissions.doc. June.

Wiemeyer, S., P. Tuttle, and D. Higgins. 2004. Aquatic biota monitoring on the Humboldt River, Nevada, in relation to mine dewatering discharges. Final Report, U.S. Fish and Wildlife Service, Off-Refuge Investigations Sub-Activity FFS#1130-1F25. Reno, Nevada.

Wiggins, D. 2005. Yellow-billed Cuckoo (*Coccyzus americanus*): A Technical Conservation Assessment. Prepared for USDA Forest Service Rocky Mountain Region. Strix Ecological Research. Oklahoma City, Oklahoma.

Wilkinson, K. 2007a. Personal communication from Ken Wilkinson, wildlife biologist with BLM Elko Field Office to Joe Elliott of Geomatrix Consultants, Inc. concerning wildlife issues in the Carlin Trend area. July 12, 2007.

_____**2007b.** Electronic mail from Ken Wilkinson, wildlife biologist with BLM Elko District Office to Deb McFarlane containing comments on terrestrial wildlife. Forwarded to Terry Grotbo of Geomatrix Consultants, Inc. for consideration and inclusion in Draft SOAP and Leeville Supplemental EIS documents. August 15, 2007.

APPENDIX A

CHEMICALS STORED IN THE CARLIN TREND

TABLE A-1
Chemical Storage By Facility within the Carlin Trend

Facility Name	Facility Record #	Chemical Name	Amount Stored
Dupont Carlin Terminal	2102	Potassium Cyanide	270000 lbs
		Cyanobrik/Cryanogran	2000000 lbs
		Gasoline	50 gal
		Paint Thinner	5 gal
		Brake Cleaner	10 gal
		Propane	200 gal
		Kerosene	165 gal
Univar Usa, Inc.	5162	Hydrogen Peroxide 52%	1013021 lbs
		Methyl Alcohol	1459 lbs
		Liquichlor Bleach	1040 lbs
		Sulfuric Acid	1613392 lbs
		Hydrogen Peroxide 20-34%	10000 lbs
		Caustic Soda	158000 lbs
		Soda Ash	1900 lbs
		Copper Sulfate	8000 lbs
		Calcium Chloride Pellets	2800 lbs
		Activated Carbon	176184 lbs
Newmont Mining Corp.	7658 Rain Mine	Acetylene	1200 cft
		Diesel	4800 gal
		Gasoline	800 gal
		Propane	18500 gal
		Lime	100 ton
		Waste Oil	500 gal
		Radiation Device	40 mci
		Antifreeze	30 gal
	7659 Genesis	Oxygen	2500 cft
		Diesel	110500 gal
		Gasoline	10000 gal
		Waste Oil	10000 gal
	7660 Gold Quarry	Trona	280 ton
		Antifreeze	18960 gal
		Caustic Soda	80720 gal
		Lime	1254 ton
		Sodium Cyanide	75000 gal
		Battery Electrolyte	13949390 lbs
		Hydrogen Peroxide	22000 gal
		Sulfamic Acid	1000 lbs
		Hydrochloric Acid	6920 gal
		Oxygen	42750 cft
		Hydrogen Peroxide	7000 gal
		Acetylene	21120 cft
		Non-Flammable Compressed Gas	32835 cft
		Ammonium Nitrate	120 ton
		Explosives	10000 lbs
		Diesel	84000 gal
		Gasoline	20000 gal
		Radiation Device	10165 mci
		Waste Oil	26440 gal
		Propane	2000575 gal
		Zep Solvent	385 gal

TABLE A-1
Chemical Storage By Facility within the Carlin Trend

Facility Name	Facility Record #	Chemical Name	Amount Stored
		Elemental Mercury	8000 lbs
		Chlorine	1050 lbs
		Freon R134a	180 lbs
		Ammonium Sulfate	24000 lbs
		Freon R22	150 lbs
		Cement	40 ton
	7661 Mill #1	Diesel	14000 gal
		Acetylene	2040 cft
		Non Flammable Compressed Gas	1750 cft
		Propane	2500 gal
		Oxygen	5000 cft
		Explosives	20000 lbs
		Ammonium Nitrate	80000 lbs
		Pozzolith 400 N Cement Dispersing Agent	1500 gal
		Cement	43 ton
		Meyco Sa430 Concrete Accellerant	3000 gal
		Antifreeze	30 gal
		Waste Oil	900 gal
Union Pacific Railroad	5399	Propane	5486 lbs
		Waste Oil	74300 lbs
Barrick Goldstrike Mines	53182	Diesel	1000 gal
		Antifreeze	55 gal
		Waste Oil	440 gal
	6954	Sodium Cyanide	400000 lbs
		Caustic Soda	300000 lbs
		Hydrochloric Acid	4400 lbs
		Sulfuric Acid	9826251 lbs
		Anti Freeze	259526 lbs
		Ferric Sulfate	73957 lbs
		Hyperfloc Af-312	9000 lbs
		Chlorine	1800 lbs
		Nitrogen	10725 lbs
		Argon	2072
		Apmol Motrate	982600 lbs
		Super Floc 216	1000 lbs
		Copper Sulfate	54000 lbs
		Hydrogen Peroxide	192046 lbs
		Automatic Transmission Fluid	2490 lbs
		Diesel Fuel #2	20000 lbs
		Gasoline	75000 lbs
		Propane	1020000 lbs
		Acetyleene	4000 lbs
		Salt Peter Nitrate	300 lbs
		Potassium Permanganate	100 lbs
		Potassium Chlorate	7 lbs
		Oxygen	10000lbs
		Cat Cooster/Pentolite	80000 lbs
		Detonating Cord	138000 lbs
		Nitric Acid	147092 lbs
		Diethylamino Bensylidine Rhoda	1 lbs

TABLE A-1
Chemical Storage By Facility within the Carlin Trend

Facility Name	Facility Record #	Chemical Name	Amount Stored
		Silver Nitrate	5 lbs
		Bleach	1520 lbs
		Milk Of Lime	1440000 lbs
		Activated Charcoal	40000 lbs
		Kerosene	7000 lbs
		Ammonia	12504 lbs
		Betz Inhibitor 25k	3
		Ammonium Hydroxide	59845 lbs
		Potassium Dichromate	3 lbs
		Hydrofluoric Acid	28 lbs
		Potassium Biphalate	2 lbs
		Ume	7736815 lbs
		Valugard 350	55 gal
		Biosperse 280 Microbiocide	1073 lbs
		Aqueous 83%	2000 lbs
		Magnesium Oxide	20000 lbs
		Magnesium Sulfate	2 gal
		Propanol	6 lbs
		Methyl Alcohol	23 lbs
		Acetone	7 lbs
		Methyl Isubutyl Ketone	23 lbs
		Soda Ash	400000 lbs
		Ammonium Bisulfate Solution	172050 lbs
		Sodium Nitrate	700 lbs
		Sulfanic Acid	3000 lbs
		Borax	1500 lbs
		Propylene Glycol	960 lbs
		Valugard 100	67891 lbs
		Activated Alumina	650000 lbs
		Omni Brominating Tablets	6200 lbs
		Used Oil	11310 lbs
		Alkyl Sulfate	12450 gal
		Coal	400000 lbs
		Meyco Sa 430	6000 gal
		Safety-Kleen 105 Solvent	800 gal
		Millspease 956	400 gal
		Sodium Nitrate	700 lbs
		Rheobuild 100	3000 gal
		Charge Pac 12	55 gal
		Meyco As 430	4500 gal
		Amersep Mp-92 Metals Precitant	2000 gal

Sources:
State of Nevada Fire Marshal Office. 2007 Query of Toxic Chemical Storage Database, April 4, 2007.
US Environmental Protection Agency. 2007. Query of RCRA Info Database, March 28, 2007.
http://www.epa.gov/enviro/html/rcris/rcris_query.html

APPENDIX B

TOXIC RELEASE INVENTORY

TABLE B-1

CUMULATIVE TOXICS RELEASE - 1998 THROUGH 2006 - BARRICK GOLDSTRIKE BETZE/POST MINE

Reporting Year	Releases to Air (pounds)	Releases to Water (pounds)	Releases to Land, Underground, and Other Releases (pounds)	Total On-Site Releases (pounds)
1998	94,450	49,812	426,737,892	426,882,154
1999	78,399	15,548	325,289,760	325,383,707
2000	85,611	0	346,453,567	346,539,178
2001	74,099	0	323,394,799	323,468,898
2002	57,264	0	79,045,445	79,102,709
2003	51,150	0	95,842,925	95,894,075
2004	52,228	0	52,009,692	52,061,920
2005	51,325	0	49,050,811	49,102,136
2006	51,575	0	48,592,401	48,643,976
2007	NA	NA	NA	NA
2008	NA	NA	NA	NA
Total of all Barrick Goldstrike Site TRI Releases	596,101	65,360	1,746,417,292	1,747,078,753
Percentage of Total On Site Releases to Air	0.03%			
Percentage of Total On Site Releases to Water		0.004%		
Percentage of Total On Site Releases to Land			99.96%	

TRI ID: 89803BRRCK27MIL
1998 through 2006 data compiled from http://oaspub.epa.gov/enviro/tris
2007 and 2008 data not available.

TABLE B-2

CUMULATIVE TOXICS RELEASE - 1998 THROUGH 2008 - NEWMONT NORTH OPERATIONS AREA

Reporting Year	Releases to Air (pounds)	Releases to Water (pounds)*	Releases to Land, Underground, and Other Releases (pounds)	Total On-Site Releases (pounds)
1998	33,271	0	24,782,461	24,815,732
1999	21,277	0	11,652,232	11,673,509
2000	995	0	84,160	85,155
2001	6,895	0	1,600,148	1,607,043
2002	44,031	0	300,119	344,150
2003	4,333	0	71,007	75,340
2004	10,072	0	35,004	45,076
2005	10,554	0	16,131	26,685
2006	18,633	0	98,002	116,635
2007	34,220	0	910,120	944,340
2008	15,065	0	1,387,029	1,402,094
Total North Operations Area TRI Releases	199,347	0	40,936,413	41,135,760
Percentage of Total On Site Releases to Air	0.48%			
Percentage of Total On Site Releases to Water		0.000%		
Percentage of Total On Site Releases to Land			99.52%	

TRI ID: 89822NWMNT25MIL
1998 through 2008 data compiled from http://oaspub.epa.gov/enviro/tris

* No releases reported until 2006

TABLE B-3

CUMULATIVE TOXICS RELEASE - 1998 THROUGH 2008 - NEWMONT SOUTH OPERATIONS AREA

Reporting Year	Releases to Air (pounds)	Releases to Water (pounds)	Releases to Land, Underground, and Other Releases (pounds)	Total On-Site Releases (pounds)
1998	174,773	7,088	107,130,445	107,312,306
1999	71,253	769	103,476,606	103,548,628
2000	53,257	1,135	154,157,564	154,211,956
2001	87,585	2,079	170,160,610	170,250,274
2002	41,362	0	43,102,216	43,143,578
2003	39,906	0	29,336,913	29,376,819
2004	31,386	0	29,999,983	30,031,369
2005	41,055	0	60,358,839	60,399,894
2006	62,653	0	28,371,191	28,433,844
2007	94,744	0	27,522,509	27,617,253
2008	19,485	0	26,812,830	26,832,315
Total South Operations Area TRI Releases	717,459	11,072	780,429,706	781,158,236
Percentage of Total On Site Releases to Air	0.09%			
Percentage of Total On Site Releases to Water		0.001%		
Percentage of Total On Site Releases to Land			99.91%	

TRI ID: 89822NWMNT6MAIL
1998 through 2008 data compiled from http://oaspub.epa.gov/enviro/tris

APPENDIX C

CULTURAL SURVEYS CONDUCTED IN THE CARLIN TREND

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Barrick Goldstrike Mines	Class III Cultural Resource Inventory in the Ranch Reservoir Area, Eureka County, Nevada	Tipps, and Popek 1990	BLM 1-1287 (P)	**38 sites/isolates** (CrNV-12-8005 -8009, 8020-8029, 8040-49, 8060-69, 8080-8082)	1 eligible site (8022)
Barrick Goldstrike Mines	Class III Cultural Resource Inventory of the Santa Fe Pacific Parcel, Eureka County, Nevada	Schroedl, A. 1990	BLM 1-1323 (P)	**15 sites/isolates** (CrNV-12-8182-8189, 8200-8206)	1 eligible site (8185)
Barrick Goldstrike Mines	Class III Cultural Resource Inventory of a Portion of Section 34, T. 36N, R. 49E, Eureka County, Nevada	Popek, G. 1990	BLM 1-1345 (P)	**5 sites** (CrNV-12-7687, 12-8289, 12-8300, 12-8301, 12-7687)	None are eligible
Barrick Goldstrike Mines/Betze Project	An Assessment of National Register Eligibility of 29 Cultural Properties Recorded by Desert Research Institute and P-III Associates, Inc., in the Eastern Portion of the North Block of Barrick Goldstrike Mines, Inc.'s Betze Project, Little Boulder Basin Area, Eureka County, Nevada	Newsome, *et al.* 1992	BLM 1-1527 (P)	**29 sites** CrNV-12-7240 CrNV-12-7401, 7402 CrNV-12-7241, 7389 CrNV-12-7405, 7407 CrNV-12-7406, 7409 CrNV-12-7420 CrNV-12-7423, 7424 CrNV-12-7482 CrNV-12-7627 to 7629 CrNV-12-7640 to 7642 CrNV-12-7646, 7647 CrNV-12-7649 CrNV-12-7660 to 7661 CrNV-12-7663 to 7664 CrNV-12-7680 CrNV-12-10507 CrNV-12-10545	 Eligible Eligible Not Eligible Eligible Not Eligible Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Eligible Eligible
Barrick Goldstrike Mines/Betze Project	Site Specific Data Recovery Plans for Seven Historic Properties in the Heap Leach Facility Area of the Betze Project, Little Boulder Basin Area, Nevada	Zeanah, D. *et al.* 1992	BLM 1-1548	**7 sites** CrNV-12-5681, 5682 CrNV-12-7381, 7382 CrNV-12-7404 CrNV-12-8928, 8929	All eligible
Barrick Goldstrike Mines/Little Boulder Basin	Cultural Resource Inventory and Testing in Little Boulder Basin, Eureka County, Nevada: Final Report	Russell, *et al.* 1986	BLM 1-1042	**44 sites** CrNV-12-5627-5629, 5640-5649, 5660-5663, 5683-5689, 5700-5709, 5720-5729	4 potentially eligible sites

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Barrick Goldstrike Mines/Little Boulder Basin	Site Specific Data Recovery Plan for Six Historic Properties in the North Block Tailings Disposal Facility Area, Phase II, Little Boulder Basin, Nevada	Jones, *et al.* 1994	BLM 1-1684 (P)	**6 sites** 26EU1482/1906 26EU1530, 26EU1534, 26EU4696, 26EU5374, CrNV-12-8926	All eligible
Barrick Goldstrike Mines	Archaic and Numic Encampment in the Little Boulder Basin, Eureka County, Nevada	Tipps 1988	BLM 1-1188 (P)	**2 sites** 26EU1319 26EU1320	Eligible, mitigated Eligible, tested
Barrick Mine	A Cultural Resources Survey of the Barrick Mine 120 kV Transmission Line Project in Eureka County, Nevada for Sierra Pacific Power Company	Johnson, F. 1987	BLM 1-1126 (P)	**2 sites** CrNV-12-6382 CrNV-12-6383	Not eligible
Barrrick Goldstrike Mines/Little Boulder Basin	Cultural Resource Inventory, Monitoring, and National Register Evaluations in the Little Boulder Basin Area, Nevada	Schroedl and Tipps, 1991	BLM 1-1342 (P)	**27 sites/ 7 isolated finds:** CrNV-12-8922- 8929 CrNV-12-8940-8949 CrNV-12-7408 (EK1482) CrNV-12-7421 (EK1483) CrNV-12-7326 (EU1484) CrNV-12-7328 (EU1485) CrNV-12-7344 (EU1486) CrNV-12-7345 (EU1487) CrNV-12-7361 (EU1488) CrNV-12-7365 (EU1489) CrNV-12-7366 (EU1490) CrNV-12-7385 (EU1491) CrNV-12-7440 (EK1492) CrNV-12-7400 (EK4687) CrNV-12-7228 (EK4688) CrNV-12-7403 (EK4689) CrNV-12-7229 (EK4690)	17 eligible sites (CrNV-12-8249, 8923, 8926, 8928, 8929, EU1482-1484, EU1486, EU1487, EU1489-1492, EK4687, EK4688, EK4690)

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Betze Project	Cultural Resources Technical Report for the Betze Pit Expansion Project Environmental Impact Statement, Eureka and Elko Counties, Nevada	Burke, T. 1990	BLM 1-1760	**75 sites/isolates total** (CrNV-12 5585-5589, 5600, 5661-5669, 5627-5629, 5640-5647, 5680-5686, 5701-5706, 7303-7309, 7320-7327, 7369, 7381-7384, 7389, 7400-7409, 7229, 7240, 7420-7429, 7440-7446, 7468, 7481-7482)	1 eligible site (5682); 37 ineligible, 37 unevaluated
Carlin Gold Mine	Report on an Archaeological Reconnaissance in the Vicinity of James Creek, Eureka County, Nevada	Clerico, R. 1983	BLM 1-682 (P)	**17 sites/ 10 isolated finds** (CrNV-12-3281 through 3289, 12-3300-3309, 3320-3327)	12 ineligible, 9 mitigated, 6 unevaluated (See BLM 1-727)
Carlin Gold Mine	An Evaluation of Six Archaeological Sites in the James Creek Vicinity, Eureka County, Nevada	Clerico, *et al.* 1983	BLM 1-727 (P)	**6 sites:** CrNV-12-3285 (EU839); CrNV-12-3304 (EU840); CrNV-12-3305 (EU841); CrNV-12-3309 (EU842); CrNV-12-3320 (EU843-James Creek Shelter); CrNV-12-3326 (EU844)	All eligible
Carlin Gold Mine	Nevada Department of Transportation Cultural Resources Report SR766 Elko/Eureka County Line to the Carlin Gold Mine	Mathiesen, D. and P. Matranga, 1985	BLM 1-967 (P)	26EU1270	Not eligible
Carlin Gold Mine	Proposed Data Recovery Activities at the James Creek Shelter (26EU843), Eureka County, Nevada	Elston and Budy 1984	BLM 1-1584 (P)	**1 site** CrNV-12-3320	Eligible, mitigated
Dee Gold Mine	Archaeological Report on the Evaluation of Sites CrNV-12-1986 to 1989 and CrNV-12-2000 to 2004, the Dee Gold Mine, Elko County, Nevada	Ellis, R. 1983	BLM 1-709 (P)	**9 sites:** CrNV-12-1986 to1989; CrNV-2000 to 2004	8 ineligible; 12-2004 unevaluated

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Dee Gold Mine	Cultural Resource Inventory of a 520 Acre Mining Exploration Area and an Access Road for Dee Gold Mining Company, in the Tuscarora Mountains, Elko County, Nevada	Rafferty, K. and L. Blair, 1988	BLM 1-1203 (P)	**5 sites/ 2 isolates** (no site numbers)	6 ineligible; 1 eligible
Dee Gold Mine	A Cultural Resources Inventory of a 5800' Diversion Ditch for Dee Gold Mining Company in Elko County, Nevada	Johnson, F. 1991	BLM 1-1407 (P)	**2 sites** (CrNV-12-8441 and 12-8442)	Not eligible
Dee Gold Mine	A Cultural Resources Inventory of The Waste Dump Expansion Project for Dee Gold Mining Company in Elko County, Nevada	Johnson, F. 1991	BLM 1-1408 (P)	**4 sites:** (CrNV-12-8445 to 8447 and EK4831)	1 eligible site (EK4831)
Dee Gold Mine	A Reevaluation of Cultural Resources in the Dee Gold Mining Company Waste Dump Expansion Area, Elko County, Nevada	Tipps and Popek, 1991	BLM 1-1485 (P)	**28 sites/38 isolated finds:** (CrNV-12-10440 to 10449, 10460 to 10469, 10480 to 10487)	10 eligible sites (CrNV-12-10440, 10441, 10444, 10449, 10462, 10464, 10465, 10484, 10486, 10487)
Dee Gold Mine	Dee Gold Expansion Project: A Reevaluation of 130 Acres at the Dee Gold Mine in Elko County, Nevada	Newsome, *et al.* 1992	BLM 1-1521 (P)	**7 sites** CrNV-12-8729 CrNV-12-10529 CrNV-12-10540, 10543 CrNV-12-10541, 10542 CrNV-12-10544	Eligible Eligible Eligible Not Eligible Not Eligible
Newmont Gold Lower James Creek Area	Class III Cultural Resource Inventory of the Lower James Creek Area, Section 12, T. 33N, R. 51E, Eureka County, Nevada	Popek and Strand, 1990	BLM 1-1324 (P)	**2 isolated finds**	Not eligible
Newmont Gold Lower James Creek Area	Class III Cultural Resource Inventory of the Lower James Creek Area, Section 14, T. 33N, R. 51E, Eureka County, Nevada	Popek and Schroeld, 1990	BLM 1-1340 (P)	**4 sites** (CrNV-12-8245-8248)	None eligible
Newmont Gold	Test Hole and Access Road for Newmont Gold Company, Elko County, Nevada	Brewster, M. 1990	BLM 1-1480 (P)	CrNV-12-8325; CrNV-12-3283	Unevaluated

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Newmont Gold	A Cultural Resources Inventory of 60 AC of the Lorri/KL Claim and 5.5 Miles of Linear Transect for a Proposed Pipeline for Newmont Exploration Limited in Eureka County, Nevada	Hause, L. 1991	BLM 1-1501 (P)	**3 sites** (CrNV-12-10422-10424)	None eligible
Newmont-Blue Star/Genesis Mine (EA filed 1989)	A Class III Cultural Resources Inventory for the Genesis Blue Star Project, Eureka County Nevada. P-III Associates, Inc.	Birnie, Robert I. 2006	BLM 1-2528(P)	**12 Sites** CRNV-12-7160 CRNV-12-10565 CRNV-12-13732 CRNV-12-13733 CRNV-12-13734 CRNV-12-13735 CRNV-12-13736 CRNV-12-13737 CRNV-12-13738 CRNV-12-13739 CRNV-12-13740 CRNV-12-13741	1 site: CRNV-12-10565
Newmont Mine Leeville Pipeline	Cultural Resource Inventory of Alternative Routes for the Proposed Leeville Dewatering Pipeline, Eureka County, Nevada.	Newsome, Daniel K. 2000	BLM 1-1652 (P)	CRNV-12-7162 CRNV-12-10801	1 eligible site (10801)
Newmont-Mike Exploration Project	Class III Cultural Resource Inventory of the Mike Addition, Eureka County, Nevada. BLM report 1-2510(P), P-III Associates, Inc. Salt Lake City, Utah.	Bright, J.R. 2006	BLM 1-2510(P)	**6 sites** CRNV-12-13647 CRNV-12-13648 CRNV-12-13649 CRNV-12-13650 CRNV-12-13651 CRNV-12-13652	3 eligible sites CRNV-12-13650 CRNV-12-13651 CRNV-12-13652

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Newmont Mine	Reassessment of Site Significance for CRNV-12-10801. BLM Elko Field office	Hockett, Bryan 2006	1-2555(P)	CRNV-12-10801	Eligible
Newmont-Pete Project	Class III Cultural Resource Inventory of the Pete Addition, Eureka County, Nevada. BLM report 1-1935(P), P-III Associates, Inc. Salt Lake City, Utah.	Newsome, Daniel K. 2000	BLM 1-1935(P)	**6 sites** CRNV-12-11424 CRNV-12-11425 CRNV-12-11427 CRNV-11-10038 CRNV-11-10039 CRNV-11-10050	1 eligible site CrNV-11-11039
Newmont Mine South Operations Area	A Class III Cultural Resources Inventory of 837 Acres in Newmont Mining Corporation's South Operations Area, Elko and Eureka Counties, Nevada	Birnie and Knoll 2006	BLM 1-2397 (P)	**9 sites** CRNV-12-11507 CRNV-12-11508 CRNV-12-13293 CRNV-12-13294 CRNV-12-13295 CRNV-12-13296 CRNV-12-13297 CRNV-12-13298 CRNV-12-13299	4 eligible sites CRNV-12-11507 CRNV-12-13293 CRNV-12-13294 CRNV-12-13296
Newmont Mine South Operations Area	South Operations Area Project Amendment (SOAPA) (EIS filed 2002)			**53 sites total**	8 eligible sites CRNV-11-9292 CRNV-11-9293 CRNV-11-9294 CRNV-11-9279 CRNV-11-9290 CRNV-11-9291 CRNV-12-3320 CRNV-12-3283

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Newmont-High Desert (EA filed 1992)	A Treatment Plan for Historic Site 26EU2505, North-Central Nevada. P-III Associates, Inc. Salt Lake City, Utah.	Schroedl 2006	BLM 1-2530(P)	CRNV-12-12466	Eligible
Newmont Gold Chevas Parcel	Cultural Resource Inventory of the Chevas Parcel, Eureka County, Nevada	Newsome, D. 1992	BLM 1-1628 (P)	**18 sites** (CRNV-12-1840, 6381, 6989, 11063-11069, 11080-11087)	None eligible
Newmont Gold	Cultural Resource Inventory and Testing in Section 3, T. 35 N, R. 50 E, Eureka County, Nevada	Stratford, Mary 1996	BLM 1-1636	**10 sites** 5073-1 through 5073-10	All not eligible
Newmont Gold Bootstrap/Capstone Area	Site-Specific Data Recovery Plan for Five Prehistoric Cultural Properties in the Bootstrap/Capstone Project Area, Upper Boulder Valley, Nevada	Jones, *et al.* 1996	BLM 1-2024 (P)	**5 sites** CrNV-12-7345 (EU1487) CrNV-12-7440 (EU1492) CrNV-12-7940 CrNV-12-7368 CrNV-12-7364	All eligible
Newmont Gold Carlin Operations Area	Cultural Resource Inventory of a Fence Corridor Near the Carlin Operations Area in Eureka County, Nevada	Newsome, D. 1996	BLM 1-2027 (N)	None	
Newmont Gold South Operations Area	A Class III Cultural Resource Inventory of Newmont Gold Company South Operations Area Eureka County, Nevada	Lennon, T. and R. Peterson 1991	BLM 1-1403 (P)	26EU1660	Not eligible
Newmont Gold South Operations Area	Cultural Resources Inventory of Miscellaneous Parcels in the Gold Quarry South Operations Area, Elko and Eureka Counties, Nevada	Tips and Newsome, 1993	BLM 1-1746 (P)	1 isolated find	Not eligible
Newmont Gold South Operations Area	Cultural Resources Inventory of the GQX Parcels and Summary of the South Operations Area Project, Elko and Eureka Counties, Nevada	Newsome, D. and Tipps 1997	BLM 1-1651	**17 sites** CrNV-12-3283 CrNV-11-9292 CrNV-11-9293 CrNV-11-9294 CrNV-12-8325 CrNV-11-9276 CrNV-11-9277	 Eligible Eligible Eligible Eligible Not Eligible Not Eligible Not Eligible

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
				CrNV-11-9278 CrNV-11-9295 CrNV-11-9296 CrNV-11-9297 CrNV-11-9298 CrNV-11-9299 CrNV-11-9310 CrNV-11-9279 CrNV-11-9290 CrMV-11-9291	Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Unevaluated Unevaluated Unevaluated
Newmont Mine Mill No. 4	Cultural Resource Inventory of the No. 4 Mill Project, Eureka County, Nevada	Burke, T. 1988	BLM 1-1142 (P)	**4 sites** (CrNV-6387 through 6389, 6400)	None are eligible
Newmont Mine Bluestar Operations	A Cultural Resources Survey of the Bluestar Operations Area in Eureka County, Nevada, for Newmont Gold Company	Johnson, F. 1988	BLM 1-1209 (P)	**11 sites** CrNV-1838 CrNV-1839 B-1 through B-9	Unevaluated Not eligible Not eligible
Newmont Mine Tusc-Mac Area	Cultural Resource Inventory of the Tusc-Mac Area, Eureka County, Nevada	Tipps, B. *et al.* 1990	BLM 1-1341 (P)	**12 sites** CrNV-12-8260 through CrNV-12-8269, CrNV-12-8280, 8281	Not eligible
Newmont Mine	The Newmont Rodeo Creek Survey: Class III Cultural Resource Inventory of a Portion of Section 19, T. 36N, R. 50E, and a Portion of Section 24, T. 36N, R. 49E, Eureka County, Nevada	Tipps, B. *et al.* 1991	BLM 1-1509	**7 sites** 26EU1320 26EU1734 26EU1785-1789	4 eligible sites (EU1320, EU1734, EU1785, EU1786)
Newmont Mine	Class III Cultural Resource Inventory of Portions of Sections 17, 18, 19, 20, and 30, T. 36N, R. 50E, Eureka County, Nevada	Newsome, D. *et al.* 1993	BLM 1-1684 (P)	**6 sites** CrNV-12-5585 CrNV-12-5681 (EU1734) CrNV-12-10546 (EU1785) CrNV-12-11260 to 11262	Not eligible Eligible Eligible Not eligible

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Newmont Mine Carlin Trend	Cultural Resource Inventory of the Carlin Trend and Valmy Trend Land Exchange Parcels, Elko, Eureka, and Humboldt Counties, Nevada	Newsome *et al.* 1998	BLM 1-1774 (P)	**36 sites/isolates total** (CrNV-12-11028, 12-11029, 12-11040-11048, 11022-11027, 11047-11048, 11-9078, 11-9098-9099, 11-9110-9113, 12-8245-8247, 12-11344-11349, 12-11360-11362, 12-9776-9779, 12-9790-9791)	5 eligible sites (12-11043, 11-9098, 11-9099, 11-9110, 11-9111)
Newmont Mine	Additional Cultural Resource Inventory of the Newmont Gold Company Mill Ore Haul Road and a Portion of the Maggie Creek Drainage, Eureka and Elko Counties, Nevada	Kenzle, S. 1993	BLM 1-1807 (P)	**4 sites** CrNV-12-11722 CrNV-12-11723 CrNV-12-11724 CrNV-12-11725	Not eligible Eligible Not eligible Eligible
Newmont Mine	Cultural Resource Inventory of the Newmont Gold Company Diversion Channel Extension in Eureka County, Nevada	Kenzle, S. 1994	BLM 1-1888 (N)	None	
Newmont Mine	Cultural Resource Inventory of Section 9, Township 35N, Range 50E, Eureka County, Nevada	Kenzle, S. 1994	BLM 1-1942 (P)	CrNV-12-12023 CrNV-12-12024	Not eligible
Newmont Mine	Cultural Resources Inventory of the Boulder Creek and Dunphy Road Realignment Project Area, Elko County, Nevada	Jones 1994	BLM 1-1947	**3 sites** 5050-1and 5050-2 CrNV-12-10448	Eligible Eligible
Newmont Mine	Newmont Explorations Bell Creek Project Cultural Resources Report	Spencer 1985	BLM 1-947 (P)	CrNV-12-5004	Not eligible
Newmont Mine Bootstrap Area	Class II and III Cultural Resource Inventory in the Bootstrap Operations Area, Elko and Eureka Counties, Nevada	Tipps, B. 1989	BLM 1-1268 (P)	**83 sites/ isolated finds** (CrNV-12-7965, 7920-7921, 01-7103, 12-7922-7929, 7940-7949, 7960-7964, 7805-7809, 7820-7829, 7840-7849, 7860-7869, 7871, 7880-787889, 7900-7909)	3 eligible sites (CrNV-1-7103, 12-7921, 12-7940)

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
Newmont Mine Bootstrap/Capstone Area	Cultural Resource Inventory of Private Lands in the Bootstrap/Capstone Area, Elko and Eureka Counties, Nevada	Newsome, D. 1995	BLM 1-1988 (P)	**60 sites total**	
				CrNV-12-2004	Not Eligible
				CrNV-12-7103	Eligible
				CrNV-12-7360	Not Eligible
				CrNV-12-7364	Eligible
				CrNV-12-7368	Eligible
				CrNV-12-7447	Eligible
				CrNV-12-7842	Not Eligible
				CrNV-12-7861	Not Eligible
				CrNV-12-7888	Not Eligible
				CrNV-12-7903	Not Eligible
				CrNV-12-7921	Eligible
				CrNV-12-7924	Eligible
				CrNV-12-7929	Not Eligible
				CrNV-12-7941	Not Eligible
				CrNV-12-7960	Not Eligible
				CrNV-12-7962	Not Eligible
				CrNV-12-7964	Not Eligible
				CrNV-12-8783	Not Eligible
				CrNV-12-8923	Eligible
				CrNV-12-10448	Eligible
				CrNV-12-10486	Eligible
				CrNV-12-11166	Eligible
				CrNV-12-11167	Not Eligible
				CrNV-12-11600	Not Eligible
				CrNV-12-11626-11627	Eligible
				CrNV-12-11640	Not Eligible
				CrNV-12-11641	Eligible
				CrNV-12-11644-11645	Eligible
				CrNV-12-11649	Not Eligible
				CrNV-12-11660	Not Eligible
				CrNV-12-11664	Not Eligible
				CrNV-12-12026-12027	Eligible
				CrNV-12-12245-12247	Not Eligible
				CrNV-12-12248	Eligible
				CrNV-12-12249	Not Eligible
				CrNV-12-12260	Not Eligible
				CrNV-12-12261	Eligible

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
				CrNV-12-12262 CrNV-12-12263-12264 CrNV-12-12265-12266 CrNV-12-12267-12269 CrNV-12-12280 CrNV-12-12281-12285 CrNV-12-12286-12289	Eligible Not Eligible Eligible Not Eligible Eligible Not Eligible Eligible
Newmont Mine/Blue Star Area	Cultural Resource Evaluation of the Blue Star Mine Area in Eureka County, Nevada	Stratford, M. 1994	BLM 1-1944 (N)	None	
	Right-of-Way for Powerline, Sierra Pacific Power	Dailey, R. T. 1987	BLM 1-1089 (P)	CrNV-6146, 6147	Not Eligible
	Archaeological Survey of Access Roads to the Barrick 120 kV Powerline Right-of-Way for Sierra Pacific Power Company	Hubbard, T. 1988	BLM 1-1148 (N)	None	
	Archaeological Survey of Sierra Pacific Power Company's Proposed Ivanhoe 120 kV Extension	McLane, A. 1988	BLM 1-1240 (P)	**29 sites** (No Site Numbers)	11 potentially eligible
	Archaeological Inventory of Santa Fe Pacific Mining Company's Proposed Boulder Valley Exploration/Access Road	Young, B. 1989	BLM 1-1248 (P)	CrNV-12-7682, 7683, 7685-7688	None eligible
	Cultural Resource Inventory of Four Road Corridors in the Kinsley Mountains, Elko County, Nevada	Newsome, D. 1992	BLM 1-1290 (N)	None	
	The Schroeder Mountain Road Survey, Cultural Resources Report	Popek and Tipps 1991	BLM 1-1505 (N)	None	
	An Archaeological Survey for the Proposed 120 kV Transmission Line From Coyote Creek to Bazza, Elko and Eureka Counties, Nevada	Botti, *et al*, 1992	BLM 1-1520 (P)	**17 sites total** CrNV-12-273/7728 CrNV-12-292 CrNV-12-1736 CrNV-12-4060 CrNV-12-4063-4064 CrNV-12-7443 CrNV-12-10509 CrNV-12-10520-10528	Unknown

TABLE C-1
Cultural Surveys Conducted in the Carlin Trend

Mine Name	Title	Author, Date	BLM Report No.	Sites	National Register Eligibility Recommendation
	Cultural Resources Inventory Report for a Sierra Pacific Power Co. Transmission Line	Kautz, 1992	BLM 1-1687 (P)	CrNV-12-7360, 7962	Not Eligible
	Cultural Resource Inventory of the Maggie Creek Pipeline and Reservoir Area, Eureka and Elko Counties, Nevada	Kice, D. 1992	BLM 1-1722	**6 sites** (CrNV-12-11504-11509)	1 eligible site (12-11507)
	An Archaeological Inventory of a Proposed 345/120 kV Transmission Line Between the Valmy, Falcon, an Bell Creek stations in Humboldt, Lander, and Eureka Counties, Nevada	Mariah Associates Inc.	BLM 1-1788 (P)	**16 Sites** (CrNV-12-11561-11569, 11580-11584, 11586, CrNV-21-5846	None eligible
	Cultural Resource Monitoring of Six Exploration Drill Sites and an Associated Access Road in Section 12, T. 35N, R. 50E, Eureka County, Nevada	Newsome, D. 1994	BLM 1-1946 (N)	None	
	Cultural Resources Report for the T Lazy S/25 Corporation Allotment Boundary Fences	King and Vance, 1980	BLM 1-284 (P)	CrNV-01-1530	Unevaluated
	Proposed Underground Telephone Cable, Nevada Bell, Cultural Resources Report	Nelson, K. 1980	BLM 1-330 (N)	None	
	Cordex Mining Plan of Operations Cultural Resource Report	Jaynes, S. 1981	BLM 1-484 (P)	**9 sites:** CrNV-12-1986 to1989; CrNV-2000 to 2004	4 potentially eligible sites
	A Cultural Resource Inventory of the Elko to Carlin Transmission Line, Elko County, Nevada	Gallagher, *et al.* 1982	BLM 1-642 (P)	**2 sites** (No Site numbers)	Unevaluated
Western States Minerals	Cultural Resource Inventory in the Little Boulder Basin, Eureka County, Nevada	Schroedl 1986	BLM 1-1040 (P)	**6 sites** WSM-1 WSM-2 WSM-3 WSM-4 WSM-5 WSM-6	Unevaluated Unevaluated Unevaluated Unevaluated Unevaluated Unevaluated

TABLE C-2
Sites Mitigated in the Area of Potential Effect

Mine Name	Title	Author, Date	BLM Report No.	Sites Mitigated
Barrick Goldstrike Mines	Archaic and Numic Encampment in the Little Boulder Basin, Eureka County, Nevada	Tipps, B. 1988	BLM1-1188(P)	26EU1319/CRNV-12-5588 26EU1320
Barrick Goldstrike Mines	Open Site Archeology in Little Boulder Basin: 1993-1994 Data Recovery Excavations in the North Block Tailings Impoundment Area, North-Central Nevada	Schroedl, A. 1996	BLM1-1614(P)	26EK4687/CRNV-12-7400 26EK4690/CRNV-12-7229 26EK4695/CRNV-12-7401 26EK4696/CRNV-12-7402 26EK5374/CRNV-12-10545 26EU1482/CRNV-12-5664 26EU1483/CRNV-12-7421 26EU1530/CRNV-12-7240 26EU1531/CRNV-12-7407 26EU1534/CRNV-12-5665 26EU1667/CRNV-12-7146 26EU1904/CRNV-12-8926 26EU1906/CRNV-12-8249
Barrick Goldstrike Mines	Data Recovery at the Yaha Site: An Open Prehistoric Camp Site Along Rodeo Creek, Northern Eureka County, Nevada	LaFond, A. 1995	BLM1-1683(P)	26EU1997/CRNV-12-11148
Barrick Goldstrike Mines	Depression Era Quicksilver Mining in Little Boulder Basin: Data Recovery Excavations at Site 26EU1523	Jones, J. 1994	BLM1-1849(P)	26EU1523/CRNV-12-7381
Barrick Goldstrike Mines	Data Recovery Excavations at Site 26EU1494	LaFond, A. 1995	BLM1-2020(P)	26EU1494/CRNV-12-7303
Barrick Goldstrike Mines	Open Site Archeology in Little Boulder Basin: 1992 Data Recovery Excavations in the North Block Heap Leach Facility Area, North-Central Nevada	Schroedl, A. 1995	BLM1-2021(P)	26EU1529/CRNV-12-7404 26EU5200/CRNV-12-8928 26EU1581/CRNV-12-8929 26EU1524/CRNV-12-7382 26EU1734/CRNV-12-5681 26EU1320/CRNV-12-5682
Barrick Goldstrike Mines	Data Recovery Excavations at the Santa Fe Site, Eureka County, Nevada	Schroedl, A. 1994	BLM1-2450(P)	26EU1595/CRNV-12-8185
Barrick Goldstrike Mines	Test Excavation of 5 Sites in Barrick Goldstrike's Expansion, Little Boulder Basin	SWCA 2007	BLM1-2594(P)	26EU1548/12-7446 26EU1539/12-7426 26EU2126/12-11124 26EU2064/12-10507 26EU1533/12-7420
Barrick Goldstrike Mines	Data Recovery Excavations at Site 26EK4688, Elko County, North-Central Nevada	Birnie, R. 2001	BLM1-2159(P)	26EK4688/CRNV-12-7228
Barrick Goldstrike Mines	Data Recovery Excavations at Site 26EK6487, Elko County, North-Central Nevada	Birnie, R. 2000	BLM1-2052(P)	26EK6487/CRNV-12-9196
Barrick Goldstrike Mines	Report Pending			26EU1785/CRNV-12-10546
Dee Gold Mine	1996 Open Site Archaeology Near Upper Boulder Creek: Data Recovery Excavations at Site 26EK5270, EK5271, and EK5274	Tipps, B. 1996	BLM1-1753(P)	26EK5270/CRNV-12-10440 26EK5271/CRNV-12-10441 26EK5274/CRNV-12-10444
Newmont Genesis/Blue Star Area	Data Recovery Excavations at Site 26EU1505, Eureka County, Nevada	Tipps, B. Stratford, M. 1996	BLM1-1574(P)	26EU1505/CRNV-12-7324

TABLE C-2
Sites Mitigated in the Area of Potential Effect

Mine Name	Title	Author, Date	BLM Report No.	Sites Mitigated
Newmont Genesis/Blue Star Area	Data Recovery Excavations at Site 26EU2124 (CRNV-12-11122)	Stratford, M. 1995	BLM1-2446(P)	26EU2124/CRNV-12-11122
Newmont Genesis/Blue Star Area	Data Recovery Excavations at Site 26EU6232	Schroedl, A. 1996	BLM1-2447(P)	26EU6232
Newmont Genesis/Blue Star Area	Surface Collection, Mapping, and Testing of Site 26EK5278 (CRNV-12-10448)	Schroedl, A. Tallman, D. 1997	BLM1-2448(P)	26EK5278/CRNV-12-10448
Newmont Genesis/Blue Star Area	Two Penny Ridge: Numic Occupation Along Boulder Creek	Schroedl, A. Kenzle, S. 1997	BLM1-2449(P)	26EK6231/CRNV-12-12026
Newmont Genesis/Blue Star Area	Reassessment of Site Significance for CRNV-12-10801	Hockett, B. 2006	BLM1-2555(P)	CRNV-12-10801
Newmont South Operations Area	An Evaluation of Six Archaeological Sites in the James Creek Vicinity, Eureka County, Nevada	Clerico et al. 1983	BLM1-727(P)	26EU839/CRNV-12-3285 26EU840/CRNV-12-3304 26EU841/CRNV-12-3305 26EU842/CRNV-12-3309 26EU844/CRNV-12-3326 James Creek Shelter Tested (26EU843/CRNV-12-3320)
Newmont South Operations Area	The Archaeology of James Creek Shelter	Elston, R. Budy, E. 1990	BLM1-1584(P)	26EU843/CRNV-12-3320 – James Creek Shelter
Newmont South Operations Area	Spring Site Archaeology in the Lower Maggie Creek Area: Data Recovery Excavations at 3 Sites Along Simon Creek	Tipps, B. 1996	BLM1-1773(P)	26EU2181/CRNV-12-11421 26EU2182/CRNV-12-11422 26EU2183/CRNV-12-11725
Newmont South Operations Area	Data Recovery Excavations at Site 26EU2184: A Multicomponent Spring Site in the Lower Maggie Creek Area	Tipps, B. 1997	BLM1-1756(P)	26EU2184/CRNV-12-11428
Newmont Bootstrap Area	Open Site Archaeology: 1996 Bootstrap Data Recovery Excavations	Schroedl, A. 1998	BLM1-1897(P)	26EU1487/CRNV-12-7345 26EU1492/CRNV-12-7440 26EU1520/CRNV-12-7364 26EU1522/CRNV-12-7368
Newmont High Desert	Mitigation of Site 26EU2505*	Birnie, R. 2007	BLM1-2608(P)	26EU2505/CRNV-12-12466

Total number of sites mitigated within the APE: 57

*Sites inadvertently damaged that required subsequent mitigation.